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BOARD OF NATURAL RESOURCES
COLSTRIP HEARINGS

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MONDAY, MARCH 29, 1976

The hearing reconvened at 9:05 A.M. on Monday, March 29, 1976, in the Chambers of the Montana House of Representatives, State Capitol, Helena, Montana.

The Honorable Carl M. Davis, Hearings Examiner, presided over the proceedings.

APPEARANCES:

Applicants:

William M. Bellingham, Esq.
John L. Peterson, Esq.
John Ross, Esq.

Department of Natural Resources and Conservation:

Arden E. Shenker, Esq.
William G. Sheridan, Esq.
Donald MacIntyre, Esq.

Northern Plains Resource Council:

Leo Graybill, Jr., Esq.

Northern Cheyenne Tribe, Inc.:

Peter Michael Meloy, Esq.

The following proceedings were had:

DR. PETER R. EDMONDS, recalled as a rebuttal witness by the applicants, having previously been sworn and having testified in this matter, was further examined and testified as follows:

MR. PETERSON: Mr. Davis, I have a few corrections.
Are you going to re-swear the witness? He's already

been sworn.

HEARINGS EXAMINER: He's already been sworn so we won't re-swear him.

MR. PETERSON: Beginning on page 1 of Mr. Edmonds rebuttal testimony at line 22, 23, and 24, the word "affects," a-f-f-e-c-t-s, should read "effects," e-f-f-e-c-t-s, and the same correction should be made at page 2, line 8. At page 2, line 16, the figures 0.02 ppm should read 0.25 ppm. On page 3, line 5, the word "calculated" is misspelled. At page 5, line 7, the word "of" should read "or."

HEARINGS EXAMINER: That's between 24 hours and 2.4?

MR. PETERSON: I've got page 5, line 7, the word "of" should read "or." And on page 5, line 21, the word "danger" should read "damage." On page 8, line 2, the word "important" is misspelled. On page 10, line 11, the word "of," again, should read "or." On page 12, line 18, the word "corallative" should read "correlative." And on page 14, line 5, the word "sodium" should be deleted. On page 14, line 10, the word "along" should read "alone." Page 15, line 6, the word should read "Philadelphia." The "a" has been left out. Page 16, line 1, "gases" should read "ions." Page 17, line 11, the words "has been" should read "would be." Acidity would be. And on page 17, line 25, the words "an instant" should read -- be stricken, and the word "a" -- "have a neutralizing" --

MR. SHERIDAN: What line's that, John?

MR. PETERSON: Line 25. And the last change is page 18, line 21, the word should read "plume." And those are all the corrections made principally because of typographical errors.

HEARINGS EXAMINER: Very well. The corrections are all made in the record. You don't have any exhibits?

MR. PETERSON: No.

HEARINGS EXAMINER: Very well. Mr. Sheridan?

(THE WRITTEN DIRECT TESTIMONY OF DR. PETER R. EDMONDS WAS DIRECTED TO BE INSERTED AT THIS POINT.)

REBUTTAL TESTIMONY OF DR. PETER R. EDMONDS

During the course of these proceedings, literally volumes of evidence have been presented both pro and con regarding the bioecological concerns resulting from the operation of Colstrip Units 1-4. All such evidence deserves close and comparative scrutiny by the BNRC Board members in their evaluation of the assumptions made, the validity and pertinence of the data presented and the conclusions reached for predicting both short- and long-term effects.

In preparing this final statement for the BNRC Board members, I have carefully and objectively re-examined the evidence presented both before and after my initial testimony. From this review I have found that not only were my original conclusions upheld, but that they are actually substantiated with evidence presented by parties testifying in opposition to the view that no significant damage will result from operation of the Colstrip generating facility.

No contradictory evidence nor even meaningful recognition during my cross and recross examination has been given to present other views on the subjects pertaining to the insignificant short- and long-term effects to be expected from the emission of nitrous oxides, synergistic effects among gases, particulates including trace elements and synergistic effects between particulates and gases. Even after the unusual opportunity by those offering different views to study and carefully evaluate my direct, cross and recross examination and even indirectly participate in my cross examination by presenting questions and evaluating my response before preparing and submitting even their direct testimony, these subjects were not addressed as being significant. I can only conclude that the lack of concern over these matters supports my view that they are not important issues with respect to Colstrip for reasons stated in my direct testimony. Other subjects which I have fully addressed and which have comprised the bulk of testimony counter to my opinion relate to the subjects of possible effects from sulfur dioxide, fluorides and acid rain.

Sulfur dioxides:

The highest levels of SO_2 calculated to be produced by all four Colstrip units are far below both state and federal standards. As stated in previous testimony, the highest calculated ground level concentration of SO_2 for all Colstrip units equals 405 ug/m^3 (0.15 ppm). This compares to the Montana one hour standard of 654 ug/m^3 (0.~~02~~25 ppm) which is not to be exceeded for more than one hour in any four consecutive days at the same receptor point. This concentration is not an average but the maximum allowable and is the level judged to represent an adequate margin of safety. A 24-hour standard of 262 ug/m^3 (0.10 ppm) which is not to be exceeded for more than one percent of the time will also be enforced. In comparison, the maximum calculated 24-hour concentration for all four Colstrip units is 63 ug/m^3 (0.02 ppm), far below the standard required. On an annual basis the Montana State Standard of 52 ug/m^3 (0.02 ppm) is far below the Federal Primary Standard of 80 ug/m^3 (0.03 ppm) and equal to the old federal secondary standard which together were based on air quality criteria allowing an adequate margin of safety necessary to protect the public health and public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air. In comparison to and going beyond this established margin of safety, the maximum c~~la~~alculated annual ground level concentration of 1.4 ug/m^3 (0.0005 ppm) is such that there would not reasonably seem any likelihood of adverse short- or long-term effects resulting from the Colstrip plant operation.

Yet even at these extremely low levels and at levels which are purported to be the same as the state standard levels, there are those that predict widespread destruction over a seven county area around Colstrip. On what basis and with what validity can such contrary opinions be stated? The primary basis for this theoretical view as presented in Dr. C. C. Gordon's testimony is explained in his interpretation of the ZAP plot studies which were meant to "simulate" conditions consistent with state standards. Not only were the basic assumptions of relationship to state standards incorrect, but the overall impression that these "unique" studies are representative of a situation which could develop because of the operation of the Colstrip plants is completely erroneous.

There are four primary reasons why the studies done on the ZAP plots are not representative of conditions that could in any way relate to what might be expected from operation of the Colstrip generating facility or Montana State standards.

1. The exposure dose of SO$_2$ on all plots, including the control, far exceeded not only the low levels expected from the Colstrip units but also the

higher state standards they were supposedly intended to simulate.

2. Extreme cross-fumigation between and among plots, even on the control plot.
3. Inadequate mixing of ambient air with the SO_2 so that vegetation was fumigated with super concentrated levels above those even recorded on the sensors.
4. Testing was done and results interpreted on vegetation that was not representative of the natural conditions normally occurring in the Colstrip area.

These are extremely serious deficiencies for the BNRC Board Members to consider when evaluating a study upon which they have been asked to base their decision concerning "the ecological consequences of the potential chronic SO_2 fumigation in the Colstrip area at the Montana annual standard of 0.02 ppm." Because they are so serious and because of the broad and erroneous conclusions which have been drawn utilizing the results of this study, I will explain the justification for each one of these points.

Considering the first point, the only factor which Dr. Gordon has considered when equating the ZAP plot fumigation levels to the Montana standards is concentration. He has given no recognition to what the standard really means, namely dose--the combined parameters of concentration as a function of time. That is why the 24-hour and the one-hour standards are expressed as concentrations not to be exceeded for more than one percent of the time or more than one hour in any four consecutive days at the same receptor point, respectively. A 24-hour standard, for example, means that the maximum allowable concentration of 0.10 ppm SO_2 cannot exceed a 24-hour period for more than 3.65 times per year. During the duration of the ZAP plot experiment, the concentration of 0.10 ppm and greater existed continuously for 4 months or 2900 hours. This is equivalent to 0.10 ppm x 2900 hours or 290 ppm-hours compared to the Montana standard of 0.10 ppm x 24 hours ~~of~~ or 2.4 ppm-hours or more than 120 times the allowable dose.

How does this relate to doses that will be detrimental to vegetation at Colstrip? Indian rice grass, by far the most sensitive species in the area, will exhibit 0.2 percent leaf damage after a continual fumigation period of 2-hours at 0.5 ppm SO_2, or 0.5 ppm x 2 hours = 1.0 ppm-hours as compared to the 290 ppm-hours on the ZAP plots. Even Ponderosa pine, which by definition is considered intermediate in sensitivity, has a demonstrated threshold level of 10.0 ppm SO_2 for 2-hours of continual fumigation (10.0 ppm x 2 hours = 20 ppm-hours) would be devastated at the ZAP dose of 290 ppm-hours! This species is not considered sensitive to SO_2 as stated by Dr. Gordon, but only intermediate in sensitivity. Even at the high fumigation level of 20 ppm-hours, the ~~danger~~ damage for Ponderosa pine is only one percent. Comparing the maximum annual average SO_2 for all four Colstrip units (0.0005 ppm x 2900 hours - 1.45 ppm-hours) the level necessary to cause even one percent damage to Ponderosa pine is more than 13 times higher than would occur in the Colstrip area of maximum ground level concentration.

The ZAP study is indeed "absolutely unique in the history of air pollution studies"! I can think of nowhere in the world where vegetation has been exposed to such atrocious and continued doses of SO_2--not even in the most heavily industrialized portion of the U.S. and Europe. In this respect, the study plots are named very appropriately. What is not appropriate is the intense and acute levels of the fumigation used. They were inherently designed to cause acute damage to existing vegetation--not the chronic, low level effects Dr. Gordon has stated they illustrate--and they in no way reflect even the most remote relationship to the well-below state standard levels calculated for the emissions from the Colstrip units. What is amazing and what should be clearly noted by the BNRC Board Members, is that even after the intense fumigation the ZAP plots received, no significant difference could be noted between vegetative productivity of the control and the study plots.

The second point, the fact that cross-fumigation has occurred throughout the study area and even over the control plot, illustrates the inadequacy of the experiment and intensifies the problems presented in the preceeding paragraphs. Contrary to the repeated statement made in Dr. Gordon's direct testimony as well as during his cross-examination that "no" cross fumigation has occurred between and among plots with higher SO_2 treatments and those with lower SO_2 treatments, his own data presented in Exhibits 228, 229 and 219, clearly show that it has occurred at least 50 percent of the time. Inspection of data presented in Exhibit 219 shows that even the control plot received higher fumigations than there was supposed to be on the 0.02 test plot "B". This fact is in considerable contrast to Dr. Gordon's repetitive insistance that no detectable levels of SO_2

were recorded on the control plot. A look at some of that data illustrates the variability and intensity of fumigation that was recorded for the period of May 24th through July 25th, 1974. These data from Dr. Gordon's Exhibit 219 in addition to my calculations in the columns labeled Experiment Time and Actual Maximum Dose are shown below.

PLOT	RANGE (ppm)	ORIGINALLY INTENDED (ppm)	EXPERIMENT TIME (hrs)	ACTUAL MAXIMUM DOSE (ppm-hrs)
A ("Control")	0.00-0.0252	0.00	1,512	38.1
B	0.0148-0.0960	0.02	1,512	145.2
C	0.0201-0.2930	0.05	1,512	443.0
D	0.0170-0.3467	0.10	1,512	524.2

From the above data, one can see that the actual fumigation levels are not those reported in the main text of Dr. Grodon's testimony, but ranged to much higher levels. Not only did extensive fumigation occur on the control plot "A" from the other plots, but other concentrations exceeded those originally intended by more than 5 times. The actual fumigation doses presented here amplify the already exaggerated and acute conditions described under the first point. A close look at Dr. Gordon's color photograph of the plots (Exhibit 227) clearly illustrates the extensive fumigation effects not only on the nearby slopes but also in the so called "buffer zones" between each of the test plots. How Dr. Gordon can staunchly maintain that there was no cross fumigation and that SO_2 concentrations on the control plot was below detectable limits is beyond my comprehension and causes me to seriously question the validity and applicability of other data presented and the conclusions drawn from them.

The third point, relating to the inadequate mixing of SO_2

with the ambient air to achieve the desired concentrations of fumigation, is imprtant to consider when equating the recorded concentrations of SO_2 with those which actually existed next to the vegetation on the fumigation plots. Sulfur dioxide is more than twice as heavy as air, and the SO_2-air mixture, having left the exit holes in the gas delivery lines, was distributed over the test plots. The concentrated SO_2, because of its much heavier weight, would tend to settle to ground level around the lower vegetation. The SO_2 monitoring sensors, located a foot above the soil surface, would record the concentration of SO_2 at that height instead of the more concentrated levels, which were actually affecting the lower vegetation.

No matter what the actual concentrations of SO_2 on each test plot were supposed to be and no matter what concentrations were actually recorded, the additive and unrecorded increase in SO_2 concentration which was affecting the vegetation was higher than had been realized because of ineffective mixing. A properly designed experiment, with more sensors located at various heights would have shown this. This factor is an incremental one with those factors already discussed under points one and two and only serves to increase the severity of the problems and erroneous conclusions associated with this entire study.

In addressing the fourth point, I call the BNRC Board Members' attention to Dr. Gordon's Exhibit 226. This photograph of the ZAP test plot area illustrates the magnitude of difference which can be seen between the treatment location itself and the surrounding typical rangeland for the Colstrip area. Because the ZAP plots were fenced and essentially isolated from grazing cattle, the vegetation in the test area was allowed to grow ungrazed and undisturbed. The dramatic comparison can be readily seen when comparing the uppermost (grazed portion) part of the photograph with the test area in the foreground.

The result of this experimental oversight is that the area being tested and later compared to natural rangeland is in no way representative of conditions present outside of the test area. Microecological differences on the test plots related to soil moisture holding capacity, available soil moisture, increased humidity, decreased surface air flow, decreased erosion, decreased loss of nutrients, increased soil temperatures, etc., all have strong influences not only in making the test area significantly different from the surrounding range, but also increasing vegetative susceptability to SO_2 damage. No wonder apologies were offered when the photographs were first shown to Lieutenant Governor William Christiansen and area ranchers--they only serve to illustrate the sharply contrasted condition of rangeland left ungrazed for a short while compared to the normal more heavily grazed condition.

Fluorides:

It seems unreasonably repetitive to restate the words already contained in my direct testimony concerning the insignificant effects expected from both gaseous and particulate fluorides. However, it seems obvious from the comments made by Dr. Gordon on page 13 of his testimony that he didn't even read or assimilate what was clearly described on pages 36 and 37 of my statement. There I referenced (number 22 of the 103 references directly used in the preparation of my testimony) in the text of 1964 study of air pollutants in and around the Billings and Laurel areas of Yellowstone County by J. L. Glenn and S. A. Duganz which summarized responsibility for atmospheric fluorides in these areas. Here James Glenn, Director of the Yellowstone County Air Pollution Agency states:

> "Data from the Laurel area makes it painfully apparent that floride levels are directly attributable to refinery operations in both the Billings and Laurel areas."

After having read my testimony containing this quote and reference, Dr. Gordon has testified that he had no knowledge of the report ~~of~~ or the conclusions therein.

I strongly urge the BNRC Board Members to read once again the statements made on pages 26-27 and 36-38 of my direct testimony which clearly shows that the effects of any fluoride emissions from Colstrip Units 1-4 will be negligible. There is no reasonable way to equate the maximum short-term (24-hour) ground-level concentration of 0.10 to 0.13 ppb gaseous fluorides from the Colstrip units to potentially deleterious effects on vegetation or animals.

It is also interesting to note the many places Dr. Gordon has either misquoted or misinterpreted statements made throughout my direct testimony and during my cross examination. Almost without exception, in places where he refers to me throughout his testimony, he is consistent in his erroneous or at best inaccurate presentation of what originally was stated. An example of such a misconceived reference may be found in his testimony (page 42) where he implies that I stated "most animals" have been analyzed for fluoride levels and he blandly states I have no scientific basis for such a remark. What I actually did state was: "Most animals are better able to tolerate fluorides in greater quantities than cattle. With carnivorous animals, fluoride transfer through the food chain is not a problem." The scientific basis for those statements may be found in my original references (numbers 70, 74, 76 and 77).

The primary paths of fluoride into the food chain are vegetation and water. Little or no fluoride is transferred through the food chain to higher organisms by way of consumption of other animals because fluoride is retained in the bones and the teeth. In humans, 99 percent of the fluoride retained in the body is localized in the skeleton. If fluoride is ingested it appears very rapidly in the urine, as much as 20 percent of it being found in the first 3-4 hours after ingestion. Nearly all that is absorbed, is excreted via this route within 24 hours.

Uptake of fluoride is related to age, sex, present and previous fluoride intake, specific bones and part of bone. Older animals store less of the intake than do younger ones.

Cattle are less tolerant of fluorides than such animals as swine, horses, poultry, rabbits, white rats, guinea pigs or turkeys. These animals are all primarily herbivores. Those animals which feed on other animals, whether carnivore or omnivore, face less of a threat of excessive fluoride uptake. Carnivores rarely ingest and digest the entire body of another animal. Small mammals may be consumed entirely, however, the bones and fur are passed out in the feces in the case of mammal carnivores or, in the case of hawks or owls, the fur, feathers and bones are regurgitated in the form of pellets. Larger mammals (i.e., calf or lamb) are never entirely ingested, as implied by Dr. Gordon, let alone digested.

Small mammals, such as deer mice, are relatively easy to collect and analyze for fluoride. These animals are low in the food chain, and are a primary source of food for carnivores. However, comparisons of fluoride levels may result in differences compounded as a result of variability between subscpecies, sex, age, etc. An analysis of C. C. Gordon's Exhibit 235 reveals some of these confounding effects as well as several inadequacies. For example, the average ppm F^- for the Billings deer mice is much closer to the lowest value for the Billings group. This seems to indicate that the highest value (2400 ppm F^-) is well above the other values in this group. When comparing the Billings values with Colstrip values in Exhibit 235, it should also be noted that the lowest value for Billings is below the highest values for Colstrip. Obviously, the weight of the mouse as well as other unspecified factors affects the measurements for F^- content in the bones. The lack of corallative data for the Billings mice further clouds the meaningfulness of the data. The above factors as well as potential differences in handling and analysis of these two sets of samples certainly reduce or raise serious questions about the value of the comparison presented in Exhibit 235.

Acid Rain:

Plants occurring in natural or managed assemblages comprise vegetation. Vegetation responds to environmental factors and to management techniques in predictable ways depending on the particular set of conditions and on interactions among these conditions. Environmental conditions that are either greater or less than ideal (optimum) produce a stress that may range from negligible if near optimum or critical if near the limits that one or more species can tolerate.

Some environmental conditions often critical in southeastern Montana are temperature, especially during the spring and summer growing season, rainfall and its affect on available soil moisture, freeze-thaw action and its affect on plant rooting, relative and absolute humidity and the affect on plant evapotranspiration, soil nutrient availability as affected by multiple factors such as grazing intensity on pastureland and so on. A few individuals claim that so called "acid rain" will become another critical factor for vegetation in southeastern Montana.

Acid precipitation was reasonably defined in my direct testimony as precipitation having a pH lower (more acid) than 5.0. Several factors have been given in my direct testimony as to why it is not reasonable to conclude that deposition of any acid rain will even occur. I was of that opinion then, and now after having been cross examined on the validity of my evidence and after having the opportunity of reading and closely analyzing Mr. Tourangeau's statement, I am of the same opinion as originally stated. Acid rain cannot in any reasonable way be represented as an environmental concern due to the operation of the Colstrip facility.

Perhaps a brief look at some of the characteristics of rain will help to clarify the issue. Rain is a very complex substance composed of organic, inorganic, soluable and insoluble fractions. If one were to filter rain water with a filter just large enough to catch the smaller bacteria (0.22 micron size) a variable array of organic and inorganic particulate matter would be found. Organics would include pollen, fungal spores, bacteria and a variety of other organic substances. Inorganic fractions (water insoluble) would include substances like silica, calcium, magnesium, ~~sodium,~~ iron, etc. The water soluble portion of rain also consists of a complex variety of anions (negatively charged ions) and cations (positively charged ions) some of which because of their relative chemical activity contribute to the acidity or alkalinity of the mixture. Most components of rain influence the resultant pH of the solution. No single component acts alone and no single species of ion is ever entirely free (complete dissociation) to determine the "final" pH. (I put the word final in quotes because the pH of rain can change considerably depending upon how long it sits at room temperature and the type of container in which it is kept.)

It seems somewhat inconsequential at this point to refer to the first half of Mr. Tourangeau's statement where he alludes to various studies in the eastern portion of the U.S. and in Europe. Those studies have been explained in my direct testimony as having no direct relationship or applicability to conditions which exist in the Colstrip area. I feel compelled, however, to point out a few facts as they relate to the testimony which I have already presented.

Much attention was given to the work of Dr. Froliger's 1973 study of acid rain in the Mt. Storm area of Maryland and West Virginia and his use of dry ice around the collection apparatus. Since the time of my cross examination on January 29th it has come to my attention that on February 6th Dr. Gordon called Dr.

Froliger to inquire if dry ice had indeed been used during the 1975 studies which I had cited. The answer was an emphatic NO! Had Dr. Gordon not immediately hung up the telephone or had Dr. Gordon or Mr. Tornangeau attended the latest conference on acid rain given by the 10th Middle Atlantic Regional Meeting of the American Chemical Society, February 23-26, 1976 in Philadelphia, Pennsylvania, they would have learned that Dr. Froliger also repeated his 1973 acid rain experiments in the Mt. Storm area without using dry ice and obtained the same results. What is even more puzzling to me is that even in Mr. Tourangeau's testimony which was prepared long after Dr. Gordon personally, albeit briefly, communicated with Dr. Froliger, he still makes reference to the use of dry ice.

Ironically a similar set of circumstances surrounds the acid rain investigations of Dr. Gordon and Mr. Tourangeau when they did their analyses for the Mt. Storm area. They weren't personally there to collect all the samples or even set out the collection apparatus. Instead they had the owner of a Christmas tree plantation (who at the time was suing the power company) set out the collection apparatus, collect the samples, transfer them into polyethelene vials and mail them to Dr. Gordon in Montana. The data presented in Dr. Gordon's Exhibit 224-C for the Mt. Storm area is the result of those collections and analyses. I would like to call the BNRC Board Members' attention to the statement just previously made. The "final" pH of rain can drastically change if not refrigerated or analyzed immediately to deter the absorption of carbonic acid from the atmosphere, abate the biological activity of organic components living in the solution, reduce the possibility of leaching ~~gases~~ IONS through the containers, as well as a host of other influencing factors. One thing seems certain, the pH levels recorded by Dr. Gordon are not representative of the actual pH values that would have been obtained had he made his measurements utilizing the proper procedures.

As an example of the kind of complexity which rain can exhibit, let us just briefly look at one possible component -- sulfur. When sulfuric acid dissolves in an aqueous solution there are four species which exist:

Hydrogen ion (H^+)
Bisulfate ion (HSO_4^-)
Sulfate ion $(SO_4^{=})$
and Undissociated sulfuric acid (H_2SO_4)

If it is incorrectly assumed (as was the case in the Montana State Department of Natural Resources and Conservation, Final Environmental Impact Statement) that there are only two species (hydrogen ion and sulfate ion), what would be the effect upon the acidity? For dilute solutions, such as would be found in rain, the hydrogen ion concentration (pH) would be over-estimated by about a factor of 2. When all four species are considered to be in solution, as is the correct assumption to make, the hydrogen ion concentration is only determined by solving four simultaneous equations.

In Table 10-31 (page 368) of the DNR statement, the pH values and sulfate values for rain at Colstrip are given. It should be noted that the calculated pH values based on the sulfate concentration are much lower than actually observed, i.e., the actual rain water at Colstrip is much less acid than would be calculated using the DNR approach. This can readily be illustrated by the following table:

(SO_4 Measured at Colstrip		(Actual (H^+)	Calculated (H^+)	Ratio
4.3	Average	2.88×10^{-7} (pH 6.54)	9.12×10^{-5}	316
20.0	High	2.19×10^{-9} (pH 8.66)	4.17×10^{-4}	190,546
0	Low	6.46×10^{-6} (pH 5.19)	1.00×10^{-7}	1,080,000

The values calculated above for hyrogen ion concentration are based upon the sulfate concentrations reported to be found in the Colstrip rain water. The ratio represents the factor by which acidity ~~has been~~ would be overpredicted by DNR, because of improper considerations of the chemistry of rain. When analyzing the contents of this table, not only should the tremendous overpredicted values stand out, but it should be noted that the levels of sulfate observed are not consistent with the actual acidity of the rain water. As the measured sulfate increases, the measured acidity of the rain water decreases. This can only be reasonably explained by the realistic fact that the sulfur, from whatever source it came, was neutralized and did not form acid.

This also illustrates a fact that I have emphasized and reemphasized many times before, i.e., a major factor which will negate even the possibility of acid rain deposition around Colstrip is the extremely basic nature of the soils and consequently a large component of the natural airborne particulate matter. These soil particulates will have ~~an instant~~ a neutralizing effect even assuming that there is the slightest potential for acid rain formation.

After having carefully evaluated the DNR's position on acid rain expressed through the opinions presented in Mr. Tourangeau's testimony, I have come to the realization that perhaps my statement in the paragraph above is much too conservative. The reasoning for this conclusion is based on grossly overestimated albeit extremely elementary and incorrect methodology Mr. Tourangeau has employed to make his calculations and offer his predictions of acidity of rain due to operation of the Colstrip power plant.

Mr. Tourangeau assumes that the SO_2 is distributed uniformly in the plume. This is the basis of the pH values he computed in (his) Table 1. The use of accpeted EPA techniques to compute concentrations from a continuous point source would not indicate that the NO_2 and SO_2 concentrations are uniform throughout the plume. For instance models acceptable to the EPA would predict a centerline concentration value of SO_2 (or NO_2) at 18 km (11.2 miles) downwind of a stack of 1/300 the concentration at 1/2 km (0.3 miles) downwind of the stack. At 60 km (37.3 miles) downwind the centerline SO_2 concentration is only 1/1000 of the value at 1/2 km. It can readily be seen, then, that the assumption of a uniform SO_2 and NO_2 distribution is completely erroneous and seriously overestimated.

At the horizontal boundaries of the effluent plume, pollutant concentrations are much lower than at the centerline. For instance, isopleths of the SO_2 concentration drawn for a cross-section of the plume at any downwind distance would be elliptical in shape. Rain falling through the center of the plume would travel through a greater vertical portion of the plume where the pollutant concentrations are highest. Near the horizontal boundaries of the plume, its vertical thickness is less as is the SO_2 concentration. Therefore, little or no H_2SO_4 would be available near the horizontal boundaries of the plume, the amount washed out by rainfall would be extremely small, and there would be little or no effect upon the acidity of the rainfall.

In any practical assessment of the production of H_2SO_4 in a plume, not only chemical mechanisms but also the dispersion rates must be considered. It has been recognized that observed rates of oxidation in the atmosphere depend upon atmospheric motions as well as upon chemical kinetics. Mr. Tourangeau's curves in (his) Figures 1, 2 and 3 appear to have been determined without any consideration of SO_2 dispersion with downwind distance. In reality the process of dispersion and reaction occur simultaneously; SO_4^{--} in droplets is dispersed while it is produced.

Even if Mr. Tourangeau's results were correct (and they are not) and used to assess the effect of acid rain production in the Colstrip area, the frequency of occurrence would be extremely low. The 30 year average rainfall for Colstrip and Billings by month are presented below (in inches).

	J	F	M	A	M	J	J	A	S	O	N	D
Colstrip	.58	.60	1.00	1.64	2.25	2.94	1.23	1.22	1.19	1.22	.66	.59
Billings	.54	.60	1.05	1.31	1.88	2.55	.90	.90	1.19	1.09	.63	.59

	Annual
Colstrip	15.12
Billings	13.23

It can be seen that the rainfall for both Billings and Colstrip are comparable. Rainfall intensities are available for Billings but not for Colstrip. The monthly and annual statistics presented above would indicate that the intensities for both locations are similar. Billings rainfall intensities have been recorded as follows:

Billings, Montana
(1949-1954)

Rainfall Intensities (Inches/hour)	Average No. of Hours per year
0.10 to 0.24	17
0.25 to 0.49	2.2
0.5 to 0.99	0.6

Rainfall intensities less than 0.10 inches per hour are probably not very efficient in washing out sulfates. From the above rainfall intensity data, it can be seen that rainfall rates of 0.2 inches per hour or more occur less than 17 hours per year and those which exceed 0.25 inches per hour average only 2.2 hours per year. The probability that the wind direction would remain in the same direction during each occurrence of precipitation of 0.2 inches per hour or greater is extremely unrealistic and acidic rain would not be expected to fall in any single area. It is doubtful, therefore, whether this relatively infrequent occurrence of acid rains would produce any measureable effect during the lifetime of a power plant.

The end result of looking at Mr. Tourangeau's calculations from their proper prospective and in the light of actual conditions as they exist in areas around Colstrip, is that at least 75 percent of the data he presents in (his) Table 1 and the Figures 1, 2 and 3 that have resulted from that table may be eliminated as being totally unrealistic. A rainfall of 0.8 inches in one hour, for example, is not even representative of the Colstrip area. When the remaining 25 percent of his data is assessed, even with all of his erroneous assumptions to obtain those data the pH values presented are not low enough to be considered acid rain.

Conclusion:

After a thorough evaluation of all testimony made available to me including the testimonies of Dr. I. J. Hindowi, Dr. C. C. Gordon and Mr. P. C. Tourangeau, in addition to all of the reports, communications and personal detailed field investigations, I wish to restate with assuredness and without qualification the same conclusions I originally had reached related to my estimation of the biological impact associated with all four units of the Colstrip generating facility.

No acid precipitation is expected to develop as a consequence of plant operation and no significant change in precipitation pH is expected to occur during the 40 year projected life of the plant.

Expected gaseous emissions concentrations of sulfur dioxide, nitrogen oxides, fluorides and mercury from the Colstrip Plant are not expected to adversely affect vegetation or fauna. Short and long-term gaseous emission concentrations will be lower than those known to injure plants or animals either directly or by acting synergistically.

Particulate deposition of trace elements under normal plant operation will not result in toxic accumulations of trace elements in local soils. Estimated quantities of particulates released during normal plant operation, deposited on local vegetation and ingested by free-ranging wildlife and domestic animals will be lower than concentrations known to harm these animals.

EXAMINATION OF DR. PETER R. EDMONDS

Rebuttal, Cross,

By Department of Natural Resources and Conservation,

By Mr. Sheridan:

Q Dr. Edmonds, when did you last testify before this body?

A I believe the date was January 29th.

Q Since January 29th, have you remained in the state of Montana for any length of time to assist counsel?

A Yes, I have.

Q How long?

A Approximately 3 days.

Q So between January 29th and today, you've only spent three days in the state?

A That's correct.

Q You were present when Dr. Gorden was cross-examined?

A Yes, I was.

Q And Mr. Tourangeau?

A Not Mr. Tourangeau.

Q You, of course, were provided copies of their testimony for your comment and preparation of responses; correct?

A That's correct, yes.

Q As for both Dr. Gorden and Mr. Tourangeau?

A That's correct.

Q You have to bear with me here. I was only provided a lined, identified copy of your statement this morning. The one that I had before doesn't have any lined identification numbers and my comments are on it so we may be a little slower in that regard. Looking at your second paragraph on page 1, you conclude that your opinions have all been upheld; is that right?

A I conclude that I am of the same opinion that I was when I wrote my direct testimony, that there will be no adverse effect resulting from the operation of Colstrip units 1 through 4.

Q Okay. You consistently, then, have not changed your opinion on that matter?

A The conclusions stated in my original direct testimony remain the same.

Q You've never made any direct studies there, have you, in Colstrip, yourself?

A How do you mean that?

Q You haven't made any field studies yourself? Have you?

A That is not true.

Q What field studies have you made at Colstrip, Dr. Edmonds, regarding the effects of SO_2 on vegetation?

A I have been to Colstrip several times, as I have indicated before, during the preparation of the Westinghouse-Colstrip environmental analysis for Montana Power Company. During that time I have surveyed the entire area. I have been to Colstrip since that time. Both situations involving several trips have been specifically looking for the effects there on Ponderosa pine and other vegetation that might be caused by effluents such as SO_2 or fluorides. I've also looked for other types of damage such as winter damage, such as insect damage, and I have made reports thereof.

Q You don't consider yourself an expert in the field of bugs, do you?

A I am not an entomologist.

Q And most of your grasses or your vegetation do not have their growing cycle during the period that you have been to Colstrip since commencement of operations of Colstrip unit 1, do they?

A That is correct.

Q And any studies you made prior to the time the Westinghouse environmental impact statement was prepared were done in the absense of any operating source which would emit SO_2 or HF in the vicinity of Colstrip?

A That is correct.

Q Going to page 2, line 13, of your statement, relating to sulfur dioxide, can you tell me for how long a period of time are the highest ground level concentrations of .15 ppm predicted to last?

A This is on the basis of a one hour or less concentration.

Q And you say that the level is judged to represent an adequate margin of safety; right?

A An adequate margin of safety at levels higher than .15 has been determined, both on a federal and a state level.

Q You read the ambient air quality standards for the state of Montana?

A Yes, I have.

Q You recognize, of course, that those rules provide that until additional pertinent information becomes available with respect to the effects of the substances listed below, referring now to sulfur dioxide, the following air quality criteria shall apply in Montana? Does that statement mean to you, Doctor, that perhaps we adjust standards as we learn more of the effects of certain gases upon vegetation?

A That statement means to me, in correlation with other statements on both the state and the federal level, that the levels that have been designated there for state, and in other places, for federal standards, indicate that there is well beyond an adequate margin of safety, and that any additional information might change those particular levels but the levels that have been stated are those that are well within the reasonable and conservative limits that would be expected.

Q You're not telling us that these standards are not subject to review, are you?

A I am not.

Q Then you know that the standard setting process, particularly for the effects of gases upon vegetation, has consistently, through the recent history, gone downward in terms of exposure?

A How do you mean that?

Q Don't we lower the levels permitted as time has progressed in the last ten years?

A You mean lower the standard requirements?

Q Lower the allowable emissions, or concentrations.

A I know that on the federal level, for example, secondary standards have been dropped because it could not be shown that there were adverse effects at those particular levels.

Q Well, let's not take isolated instances, Doctor; let's take the vast majority of the permissible ground level concentrations of gases such as SO_2, and HF; isn't it true that over the past years, those standards have become more stringent as knowledge is gained upon the effects of those gases upon vegetation?

A I think in some instances that might be the case; I think in other instances you have had an equivalent raising of those standards.

Q Well, we can go down and count them if you want to, Doctor, but won't you agree that the majority have been made more stringent?

A If that is what you say, I will, for the purposes here at this testimony, agree with what your opinions might be.

Q Thank you. Is it your understanding, Dr. Edmonds, that the pollution control devices for 3 and 4 have definitely been decided?

A Yes, it is.

Q Going to page 3 of your statement, starting your discussion on the ZAP plot studies, I'll ask you if you have ever visited the site on Taylor Creek where these studies were performed?

A I have not had the opportunity, nor have I been invited to have access to that particular area, no.

Q That's federal land, isn't it?

A I believe it is, yes.

Q Do you know where it is?

A I have a good idea.

Q Where?

A It is just about due south of Colstrip, approximately -- I'm not sure as to distance -- it's a little bit southeast, I believe, of Colstrip.

Q Have you bothered to confer with any of the investigators in the ZAP studies?

A Yes, I attended a conference in Washington, D.C. not too long ago where a paper was presented at the National Photogram Electric Society meetings describing the plot studies. I found, upon asking several questions after that paper was presented of the person who gave that particular paper, that he had no, or none of the information that I required, was not knowledgeable of the situation at Colstrip; in fact, he, himself, although he was a primary author, had never been to the site himself.

Q You're talking about Jeffrey Lee?

A Pardon me?

Q You're talking about Jeffrey Lee?

A I believe, yes; I think that was his name.

Q Can you remember the name for sure, of the individual with whom you discussed these ZAP plot studies?

A I don't recall it right off the top of my mind. I believe it started with a P, though.

Q In any event, the individual who you can't recall, with whom you discussed the ZAP plot studies in Washington, D.C., did not have the information that you required; correct?

A As I indicated, he had never been to that particular site, had no idea as to what the monitoring equipment was, had no idea as to what the distribution type of equipment was, what the rate of SO_2 would be, what the concentrations specifically were, and their variances, didn't even know specifically how the area was fenced, or if it, indeed, was fenced, and was not knowledgeable about the infrared photographs that he presented relative to specific areas and what was happening in those areas.

Q Gee whiz, Doctor, with all that lack of information, did you ask anyone else?

A Yes, I did. I reviewed the reports put out by the EPA, Corvallis, describing those experiments, and I reviewed Dr. Gordon's testimony where he described them.

Q You never went there yourself, did you?

A As I indicated before, I had not had the opportunity, nor was I invited to review personally the area of those studies.

Q Can you tell us, Doctor, where the site of those ZAP studies were performed, had it been leased for grazing in the past?

A Would you repeat your question again?

Q Do you know whether the site where the ZAP plot studies were performed, and the surrounding area, had been leased for grazing of cattle in the past?

A I don't know specifically whether the actual area of those plots had been leased in prior times, but I do know from an analysis of the photographs that were in Dr. Gordon's testimony that there had been grazing in the area and that there were cattle trails in the area and that it had been fenced off.

Q Well, can you tell us, Doctor, whether or not the areas surrounding the experimental enclosure at Taylor's Creek, was leased to grazing animals during 1975?

A You mean the specific area of that plot study, the actual plots themselves?

Q Yes.

A I don't know whether they had been or not, but I do know that during the time that that study was conducted that the area was not grazed because that was indicated as a primary factor in the design of that particular experiment.

Q Whether or not those sites had been grazed in the year during which the study had been performed, would make some difference to the development of the plots, wouldn't it?

A In looking at the study that was conducted there and the fact that the vegetation that the study was conducted on had not been grazed during the time of that study, and in fact, there was a very, very obvious difference between the vegetation of that study area and the surrounding area which was grazed, indicates to me that the area itself was not representative of the natural range lands surrounding it or at Colstrip.

Q You don't know, do you, Doctor, whether that land had been grazed?

A When?

Q During the study?

A It is my understanding from reading the information that is available to me describing those studies, that it was specifically specified that that area was not to be grazed; in fact, it was fenced off so it would not be grazed; and that during the course of that time - they specifically said in drawing up the design of that experiment - that it would not be subject to harm from grazing or trespassing.

Q Do you know what months this test was conducted?

A As I recall, it was initiated, I believe, in June.

Q Do you know when the cattle were moved off, assuming they were moved off?

A No, I do not.

Q Would it surprise you to learn that the cows were moved off that property in November of 1975?

A When you say that property, do you mean the enclosed area that the experimentation was conducted on?

Q The surrounding area, Doctor.

A Surrounding area?

Q Yes.

A In other words, not the study plots themselves?

Q Well, certainly not where they were fenced.

A Okay. Well, that's precisely my point. The area where they -- where the study plots were fenced, the area on which the study was conducted, had not been grazed. It didn't appear from the photograph that it had been. The area surrounding that plot, over a period of time, had been grazed, and it was very obvious from those photographs.

Q Have you ever seen those fences?

A No, I did not. I could not pick them out.

Q Doctor, I am showing you what has been marked DNR Exhibit 226, previously admitted, and I'll represent to you that that is the site where the ZAP plot studies were conducted. I'll ask you if you can tell me, Doctor, whether this area on this side of the fence is any different than that area on the other side of the fence?

A The area immediately over the study plot upon which the pipes are located for the dissemination of the SO_2, appears not to have been grazed heavily, whereas the area immediately outside the actual test plot itself, on either side of the fence, appears to have been grazed.

Q Do you know whether or not cattle have ever grazed on the other side of the fence?

A From the appearance of the vegetation in that area, it looks as though it has been.

Q If they were available on that ground to graze, can you tell whether or not they even grazed during the same year this study was conducted, shown in the foreground?

A I cannot tell that, no, from this photograph.

Q Have you ever discussed the EPA ZAP site studies with the following people: Dr. Robert Lewis of NERC in Corvallis?

A No, I have not.

Q Dr. Allen Lefaun, EPA, Corvallis?

A No, I have not.

Q Dr. Eric Preston, EPA, Corvallis?

A No.

Q Dr. Gerald Dodd, Colorado State University?

A No.

Q Dr. William K. Lowenroth, Colorado State University?

A No.

Q Jack Taylor, MSU, from Bozeman?

A No.

Q Did you attend the Ft. Union coal symposium in eastern Montana, or at Eastern Montana College in Billings, during April 25th and 26th of 1975?

A No, I did not.

Q I think at page 3 of your statement, starting at about line 26, you give us some primary reasons, in your opinion, why the ZAP studies were not representative of conditions. Considering your first point, you say the exposure dose of SO_2 on all plots, including the control, far exceeded not only the low levels expected from the Colstrip units, but also the higher state standards they were supposedly intended to simulate. First of all, Doctor, you used a technique in analyzing the exposure dose of multiplying concentration times time, right?

A Concentration times time, or concentration as a function of time, is dose, and that is precisely my point. When Dr. Gorden presented this --

Q There's no disagreement, Doctor, I'm just asking you.

A My point is that Dr. Gorden presented this information in his testimony. It was obvious from what he said, and also the conclusions that he drew, that he was only interested in one particular thing, and that was concentration, and had no concept as to the effect of time with that concentration, in other words, dose.

Q We'll see about that later, Doctor. First of all, it's a technique that the EPA SO_2 criteria document endorses, isn't it?

A What is the technique that they endorse?

Q Multiplying concentration as a function of time to determine dose?

A That is correct.

Q Will that technique allow you to compare the effects to be expected with different concentrations of SO_2 with differing periods of time?

A   Not alone, no.

Q   Now you state in your testimony that Indian rice grass is the most sensitive species to SO_2 in the area?

A   That is correct.

Q   Have you conducted any studies to show that yourself?

A   Indian rice grass has been identified in the Colstrip area as a normal component coming out of our vegetative studies for individual vegetative types in the Colstrip area. It is present there; it is a documented fact that Indian rice grass is extremely sensitive to SO_2.

Q   Now, answer my question. Have you conducted any studies yourself to determine that?

A   Yes, I have.

Q   What kind of studies?

A   I have been in the Colstrip area, as I've indicated before, and I have found Indian rice grass in that area.

Q   What studies did you undertake, Doctor, to determine whether or not Indian rice grass is the most sensitive species to SO_2?

A   Indian rice grass has been identified through the work of Clyde Hill in comparison of other grass species that occur in the Colstrip area, and it has been identified to be affected at very, very low concentrations, whereas the other grass species in that area are not even begun to be affected until concentration of six parts per million are reached; very, very high concentrations.

Q I know that A. Clyde Hill did the work, but did you do any work yourself?

A Do you mean experimentation on the affect of SO_2 on Indian rice grass?

Q Exactly.

A No, I did not.

Q Okay. Clyde Hill's work was not done at Colstrip, was it?

A No, it was not.

Q Are you familiar with his paper,"Sensitivity of Native Desert Vegetation to SO_2, and to SO_2 and NO_2 Combined?"

A Yes, I am.

Q Do you know whether or not Dr. Hill fumigated western wheat grass?

A He has denigrated two types of wheat grass, not specifically western wheat grass.

Q Okay. Now, just for the record, what's fumigation in the context we're using it?

A In the context that we're using it, it is an extremely high fumigation; in other words, it is using very, very high concentrations of SO_2 over prolonged period of time, time being a steady factor for two hours. A two hour fumigation for these plants is an unreal situation when you look at a practical fumigation that you might observe from a power plant.

Q So Dr. Hill's work was done under unreal situations, right?

A They were done under situations that would be the type of situation that you would not expect to occur near a power plant because they were prolonged fumigations; in other words, the end result from his experimentation is that they would be extremely conservative in the light that these plants were fumigated over longer periods than might be normally expected.

Q Conservative in view of the fact that he didn't bother to fumigate certain species, right?

A I don't know what you mean by that statement.

Q Did he fumigate western wheat grass?

A He did not fumigate western wheat grass. It doesn't grow, to my knowledge, in the area that he was working in, but he did fumigate, as I've indicated, two other species of wheat grass.

Q Well, fine. Now you tell me whether or not he fumigated the following species, Dr. Edmonds. Did he fumigate green needle and thread?

A Not to my knowledge.

Q Did he fumigate red three odd?

A Not to my knowledge.

Q Did he fumigate blue bunch wheat grass?

A I'm not sure of that one. I don't believe that he did, but he may have.

Q You have Dr. Hill's study in front of you, don't you?

A I have a list in front of me of - I haven't counted them but it looks like approximately 15 species of grasses which grow in the Colstrip area that he has fumigated. And as I've indicated before, the most sensitive of those species is Indian rice grass, first showing injury at .5 --

Q We'll get to Indian rice grass in a minute. I want you to answer my questions first.

A -- and as I've indicated, the other species --

Q Dr. Edmonds, do you want to answer my question --

HEARINGS EXAMINER: Don't interrupt when he's answering your question. You can ask another one.

A As I've indicated, out of these 15 or so species, the next highest one that shows even the slightest degree of damage does not show that until after two continual hours of fumigation at the high level of six parts per million SO_2.

Q Dr. Edmonds, are you finished?

A Yes, I am.

Q Now answer my question. Did Dr. Hill fumigate blue bunch wheat grass?

A Not to my knowledge he hasn't, no.

Q Did Dr. Hill fumigate little blue stem?

A No.

Q Did Hill fumigate silver sage?

A No, he did not.

Q Did Dr. Hill fumigate prairie june grass?

A No, not prairie june.

Q Did Dr. Hill fumigate yellow sweet clover?

A No, he did not.

Q Do you know whether or not yellow sweet clover is important to reclamation?

A Yes, it is.

Q Did Dr. Hill fumigate thread leaf sedge?

A I don't believe so.

Q Did Dr. Hill fumigate needle leaf sedge?

A Not to my knowledge.

Q Did Dr. Hill fumigate green needle grass?

A Not to my knowledge.

Q Did Dr. Hill fumigate fringed sage wort?

A Dr. Hill has not fumigated every species in the world, as I've indicated to you several times on previous occasions. He did, however, do extensive studies, and many species are located at Colstrip; they are representative of that area; he has touched upon many genera that do grow at Colstrip; and although he can't fumigate everything in the world at one time - it is beyond the abilities of any one man to do, or within reason to do - he has fumigated enough species, I feel, to be able to draw very, very good correlations between what is sensitive and what isn't sensitive, under those particular conditions.

Q Are you finished?

A Yes, I am.

Q Now answer my question please, Doctor. Did Dr. Hill fumigate fringed sage wort?

A Not to my knowledge.

Q Did Dr. Hill fumigate bainberry?

A Would you repeat that one again, please?

Q Did Dr. Hill fumigate bainberry?

A I'm not sure of that. He may have.

Q If I told you no, would you disagree?

A For the sake of time, I'm very conscious of the costs that are incurred by these proceedings, and I wouldn't want to, for the sake of argument, hold it up.

Q You'll accept that he didn't, then?

A Yes, I'll accept what you say on that.

Q Did Dr. Hill fumigate green ash?

A I don't believe he did, no.

Q Did Dr. Hill fumigate plains cottonwood?

A No.

Q Did he fumigate any species of mint?

A I don't believe he's gone into the family Laviatae at all.

Q Did you know that bainberry, green ash, plains cottonwood, and mint are important to the Northern Cheyenne tribe?

A Yes.

Q And Dr. Hill didn't fumigate them?

A As I've indicated before, there are many species that he didn't fumigate, but there are many species that he did, and enough species similar to what grow, and actually do grow, in the Colstrip area, to be able to draw some good correlations.

Q You never fumigated any of those four, did you?

A No, I did not.

Q Do you think it's fair in running a controlled experiment that the species' sensitivity that is sought to be determined should be fumigated under conditions as close to the same conditions as exist for all the species?

A I'm not entirely sure that I understand your question, but I know that a control in an experiment is an extremely important thing. I know that the control should be as similar as possible to the other types of situations that you would find throughout the rest of the experiment, but in any experiment, I realize that some things have to -- can't be perfect, and that you have to make adjustments. I also would understand that if you are to draw good correlative data and assumptions from that data, based on what you would have for a control, you should, indeed, have the control in such a place where it is not going to be affected by the other plots.

Q You basically want to have the conditions for all the species that are being fumigated or studied, the same?

A The more they are the same, under the same conditions, the more easy it is to draw correlations between what is happening; that is true.

Q Do you know where Dr. Hill conducted his studies?

A What study are you referring to?

Q His sensitivity studies, the subject of the article which I've been asking you about.

A You mean the ZAP plot studies?

Q Right.

A Do I know where he conducted them?

Q Right.

A I've indicated to you before where that plot is located.

Q Where is that?

A Taylor Creek, southeast, just about due south, but a little bit east --

HEARINGS EXAMINER: His question was Dr. Hill, not Dr. Gordon; are you confused on that?

MR. PETERSON: I think he misunderstood the question. He asked you where Dr. Hill conducted his study. Wasn't that the question?

MR. SHERIDAN: That's right.

WITNESS: I'm sorry, I misinterpreted the question.

A Dr. Hill did quite a few of his studies around the Four Corners power plant, in that area. Precisely what location he did them on, I'm not aware at this time. I believe he also did some other experiments at the University of Utah. Field studies, however, were done pretty close to the Four Corners area.

Q And that's high desert, isn't it, or cold desert?

A It's an arid area.

Q It's a cold desert area, isn't it?

A Yes. Interestingly enough, he conducted some of his experiments in that area where alfalfa is growing near the power plant, and as you probably know, alfalfa is one of the most sensitive species to SO_2, and probably the species where there is more information on the effects of SO_2, and there has been no observable damage recorded for those particular fields right near that power plant.

Q Doctor, do you know how many hours were involved in the study by Dr. Hill?

A The total number of hours?

Q Right.

A I believe it was 2,900, somewhere in that area.

Q And that was for Indian rice grass, wasn't it?

A Oh, I'm sorry, I'm thinking again of Dr. Gordon. You mean the fumigation time for Indian rice grass?

Q Right.

A All his fumigations that I'm aware of that he reported, were on two hour fumigation periods.

Q Let's go to the figures I'm addressing on page 5, line 22 or line 23. Do you see those figures?

A Yes, I do.

Q Okay, and we can drop up and see the same figures on line 4 of the same page. I'm trying to convert from the unnumbered lined advance copy of your testimony that I have and I have to shift back and forth here, so I'm sorry for the delay. Okay, now, on the ZAP plot experiments we had 2900 hours, right?

A Yes, that is correct.

Q Okay, and then you also compare the maximum annual average SO_2 for all four Colstrip units to be .0005 parts per million times 2900 hours?

A That is correct.

Q Then you get 1.45 parts per million hours; right?

A Yes.

Q Now let's assume that Dr. Hill's experiment resulted in something real, and that the cold desert eco-type of Utah Indian rice grass is indicative of the response to be expected from mixed prairie Indian rice grass at Colstrip. Can we expect Indian rice grass to be injured at Colstrip? Under those conditions?

A Under what conditions? Two hour fumigations conditions, or --

Q No. .0005 parts per million times 2900 hours.

A I would not expect that under those kinds of conditions, at .0005, in other words, five ten-thousandths of a part per million, that you would incur damage to Indian rice grass, because of the very, very low level of SO_2. In other words, you do not have a fumigation effect here.

Q When you multiply one-half part per million times two hours, what do you get? .01?

A Yes.

Q That's one-half the state standard; right?

A That's right.

Q So, let's say you get .01 times 2900 hours, a four month period, how many parts per million is that?

A 29.

Q If we accept 29 parts per million hours, under Clyde Hill's own findings, yarrow crested wheat grass, big sage brush, cheat grass, rubber rabbit bush, green rabbit bush, winter fat, snake weed, juniper, kentucky blue grass, and skunk bush will all be injured, won't they?

A If you pursue that line of reasoning, and the fact that you have, illustrates to me that you are not aware of the basic concepts that are needed in order to evaluate SO_2 effects upon the vegetation, because --

Q I just asked you to answer the question on that logic, Doctor, can you do it?

A -- because --

MR. PETERSON: Well, I think he's entitled to explain why, Mr. Davis.

A I'm answering that particular question, and the reason is simply because you're dealing here with the difference between fumigation effect and the long-term effect that would be associated with threshold conditions. And if you're dealing with five ten-thousandths of a part per million over long periods of time, you are well below those conditions that are needed -- and I say well below those ridiculous conditions that would be needed to cause injury.

Q .01 part per million times 2900 hours is a ridiculous condition as you see it, right?

A The way I see it, the maximum long-term concentrations that would come from the Colstrip units are conditions, or concentrations rather, that are so low that it is not reasonable to assume that you would even have injury to the very sensitive species of Indian rice grass.

Q In your opinion?

A That is correct.

Q That's your opinion?

A That's an opinion that is substantiated by the work of many people, as I've indicated previously, and I have them cited in my direct testimony.

Q Do you have that opinion, Doctor?

A I am reflecting the opinion of other people that have done specific work in the area, and this is my opinion.

Q You make some mention in your statement, Doctor, about the inability to detect a difference in productivity. Have you conducted any biomass investigations at Colstrip on vegetation?

A I personally have not, no; however, there have been several done.

Q And you commented in your statement on Dr. Gordon's inability to detect a difference in productivity. Did you read Dr. Gordon's statement of testimony?

A I said that there simply was not any significant difference in productivity between the control plot and the plots that have received higher levels, or higher concentrations of SO_2. This is something that Dr. Gordon has stated, both in his direct testimony, and also under cross-examination.

Q Do you know what productivity was based on in that study?

A Well, if it was done correctly, it was total biomass productivity.

Q Did that involve current live, and standing dead samples?

A That is correct.

Q And do you know whether or not the study showed there was a decrease in litter decomposition?

A I have no knowledge as to whether it did or not.

Q Do you know whether or not there was an acceleration in the phenology of western wheat grass in subsequent cycles?

A I don't know specifically that that occurred, but I'm not surprised that it has, because on other studies of fumigation of grasses that I am aware of, I know that they are, at times, at low levels of SO_2, actually benefited by those particular levels; in other words, that they have increased growth.

Q And do you know whether or not there was an increase in necrosis in western wheat grass in those studies?

A I don't know specifically for those studies, no.

Q Now, looking at your point 2 on the ZAP plot studies, you say Dr. Gordon's exhibits 228, 229, and 219 show that cross-fumigation occurred 50% of the time.

A What page are you on, please?

MR. PETERSON: 6.

HEARINGS EXAMINER: Page 6, line 24.

A I see where you are, yes. I said that it has occurred at least 50% of the time. From the amount of data available to me in those exhibits, it is 50% of the time there.

Q Looking at Exhibit 228, Doctor, how do you determine 50% of the time there were cross-fumigation conditions?

(PAUSE FOR WITNESS TO REVIEW RECORDS.)

Q Do you have your own?

A Yes, I have my own.

Q Okay, I'll keep this one then.

A Fine.

Q Where does it show on Exhibit 228 that cross-fumigation conditions existed 50% of the time?

A Taking into account, as I have indicated in my testimony, that this would be Exhibits 228 and 229, if you were to count the number of species that have been included in these particular references, there are 5 in 228, and in 229 there are 7, a total of 12 species, or at least 12 data points that have been reported. And going through those, taking the first one, for example, for *Japanicus*, it is obvious, on Exhibit 228, that there is no significant difference recorded here between the control plot and plot A; they are both the same. If that response were the same, then that would indicate cross-fumigation between the two plots. Considering *cristata*, you have no significant difference whatsoever between the control plot and the plot of highest concentration, in other words, D. In other words, they are exactly the same, which indicates cross-fumigation. If you were to consider Exhibit

229, you would have cross-fumigation, essentially, between -- that is Pelongiseta -- between the plot A and plot B because there really isn't any difference between either one of those data points. If you were to consider Tridentata, there is no difference, really, between the control plot, A, and plot B, but mainly between the control and plot A. If you look at Stipa comata, there is absolutely no difference between the data points associated with the highest control plot and the next lowest level, or the highest plot, rather, fumigation plot, and the next lowest level. And if you look at Sarothrae, you again find that there is no difference in the means associated between the control plot and plot A. This, to me, means that in order to obtain no difference between these, there had to be obvious cross-fumigation. If you count up the number of examples that I have given you, you will find that that cross-fumigation occurred in 50% of those particular instances cited here.

Q This only shows concentrations of sulfur, doesn't it? Exhibit 228 and 229?

A That's correct.

Q Where does it show time?

A I don't believe in Dr. Gordon's analysis that he ever really did consider time.

Q You can't tell off Exhibit 228, 229, any reference to time, can you?

A I cannot find in Dr. Gordon's testimony, or any portion thereof, any reference to time; therefore, he never has considered, really, the dose effect.

Q Can you, Doctor, now, trying to answer my question, tell me, looking at Exhibits 228 and 229, as you testified in your statement, any reference to time?

A These samples that he has here were taken at one particular time; in other words, there is a specific date specified, 9/28/75 for his Exhibit 229, and the other time he took his samples on 6/28/75 for Exhibit 228. These were two specific sample periods, and they were periods of sampling after which the program had been initiated.

Q Good. How long did the program go? Off Exhibit 228, tell me how long?

A I'd have to look up the exact dates to --

Q Well, you can't tell me off Exhibit 228, can you?

A I have figured it out from the point in time that he said he initiated his experiment. I don't recall right offhand how many days that was, but it's something that's very easy to do if you just look at the dates.

Q Does sulfur accumulate in vegetation?

A Quite readily, yes, it does. I know of no correlation, though, between the levels of sulfur in vegetation and effects. There is no good correlation between showing that because vegetation uptakes sulfur, and has a higher sulfur level than it might have before, that those increased concentrations of sulfur in the vegetation would be indicative of any damage effect.

Q You've never conducted any of those experiments, have you?

A I didn't hear your question.

Q You've never conducted any experiments along those lines, have you?

A Yes. I am conducting experiments, as I indicated to you before, right at the present time, in Illinois.

Q You haven't drawn any conclusions, have you?

A Not yet, no. I'm still gathering the data. The opinion that I expressed just prior to this about there being no correlation is an opinion that is expressed, however, by many people who have conducted those types of experiments.

Q Do you have Exhibit 219 in front of you, Doctor?

A Yes, I do.

Q Show us where, in Exhibit 219, you determined that cross-fumigation occurred 50% of the time?

A In Exhibit 219, I cannot specify what the percentage of time cross-fumigation occurred. The only thing that I can specify, and it's painfully obvious by looking at the data in this experiment, that, indeed, cross-fumigation has occurred, and not only has it occurred, but it has occurred at very high levels, levels high enough so that the concentration over a controlled plot, mind you I say controlled, is higher than you would normally have occurring over the first level, or first plot, for the first concentration level.

Q First of all, Doctor, you'll agree that even you are capable of making an erroneous assumption?

A On occasion.

Q Good. Let's go to page 2, Table 1. Did you look for that 50% of the time figure in that table?

A No, as I have just indicated to you, the 50% of the time figure, at least 50% of the time figure, came from Exhibits

228 and 229.

Q Would you read the caption for Table 1?

A From the exhibit itself?

Q Right.

A These are the median values of SO_2 in parts per hundred million received on the ZAP plots from 24 May to 26 July, 1975.

Q What's your definition of median?

A They would be the average values associated with those plots.

Q You're equating median with average?

A In a general sense, yes. There is a difference between the two.

Q Well, there is a mean, median, and mode; right?

A Right.

Q Okay. What's the mean average?

A Those are the averages that you have recorded here.

Q You add them all up, the mean average, right?

A Yes.

Q Isn't the median average when you have an equal number above and below a certain point?

A That's correct.

Q So it's not a real average by adding up all of the figures and dividing by --

A That's right.

Q Now, assuming that the median values are used, you're not, by your calculations, appearing on page 7, starting at line 7 of your testimony, trying to give the impression that your figures were the maximum dose actually incurred?

A The impression that I'm trying to give from repeating these figures here is the very important impression for people to understand, and that is simply the fact that, first of all, there was cross-fumigation, and secondly, the amount of cross-fumigation was extremely high on occasion. The actual duration and time of those I'm not aware of, but I know that if you were to consider the maximum amounts that would be contained there, that even on a controlled plot, you, indeed, have cross-fumigation.

Q And did you know that the maximum dose lasted only eight minutes each throughout the period 24 May to 26 July? Or, .008% of the time?

A As I indicated to you previously, the important thing in this is the fact that cross-fumigation did occur. The amount of time or the duration of that occurrence isn't really all that important. The fact is that you have a control and you're trying to compare the results of that control to the other plots, and on occasion, the time of which I don't know, the other plots can even have values as high as five times the amount that they should have on those plots.

Q Okay, good, Doctor. Let's you tell me how you calculated, on line 8, for plot A, the maximum dose for that plot?

A Well, the figures are right there. It's easy enough to follow through. I am showing you --

Q Okay, let's just go through the numbers once for the record. .025 times 1512 equals 38.1; is that right?

HEARINGS EXAMINER: We can't take you both at the same time, so we'd appreciate it if you'd take turns.

A I'll take my turn first, since it was my turn to begin with. The actual maximum dose that I've indicated in the last column is that dose that has been calculated not knowing the time, but as I've said, maximum dose that could possibly occur on that control plot, and that was at a dosage that, as you will note, is equivalent to plot B for what it was originally intended. It is higher, indeed, than what the experimental plot B would have been.

Q Right. In fact, you're misleading here a little bit when you say that's the actual maximum dose, because you don't know that's the actual maximum dose, do you?

A I know that that was, indeed, the actual maximum dose for some period of time throughout the course of that experiment.

Q Well, dose is a function of concentration times time, isn't it?

A That's correct.

Q And you don't know the time?

A That is correct.

Q So you really don't know what the actual maximum dose is. All you can say is that may have been the maximum dose for some period of time, can't you?

A I think that's quite adequately explained right in my testimony. I don't --

Q Well, can you, or can you not?

A As I've indicated, I think that that is very well explained in my testimony as to the reasoning behind putting in those columns, and I've identified the fact that I have done that, and how I did it.

Q You assume, then, what, in order to get the actual?

A I assumed only the figures that were given to me, that I was aware of, in that exhibit.

Q In order to get 38.1 as the actual maximum dose, you had to take the experiment hours, 1512, times the concentration, right?

A That's correct.

Q And in all instances for your calculations here, you took the maximum in the range, not the median, didn't you?

A That's absolutely right. As I've indicated before, the important point here is that fumigation did occur, and it did occur at extremely high levels. And it was not indicated, and I don't even know whether you have precise estimates because of your system of sensing and monitoring, whether you even know accurately what the duration of those were, or if, indeed, these are the maximum; they could have been, perhaps, much higher than that, as I've indicated in the other reasons.

Q You're not familiar with that at all, though, are you, Doctor? You're just speculating?

A I think from the data that has been given us for this, that you can make some definite decisions based on that data, such as the fact that cross-fumigation did actually occur on the control plot, but that all of these assumptions cannot be immediately determined just from that amount of data.

Q Right. And you can't tell me, can you, Doctor, how long the maximum doses lasted?

A The point of fact --

Q Can you, or can you not? Just answer that, then go ahead and explain.

A No, that cannot be determined, nor can you determine what the maximum doses were, because of the number of sensors that you had in that particular area. Now look, look at this in a very reasonable way. Try to imagine an entire acre; that area is a fairly large area. And in that area you have a maximum number, maximum number of four sensors. Where in that entire acre are you going to put those four sensors? And wherever you put them, what is going to be the kind of results that you get from that? You're going to get the actual concentration at that particular point, and not in any other point, and as indicated in the write-ups done by the people that conducted these studies themselves, the concentrations that you get coming right out of the distribution pipes are much higher than the concentrations that you would get where the sensors are. Also, you cannot tell because you haven't sensed at various heights what the differences in concentrations would be on either side of one foot above the ground. You've just had them at one particular level. Now, you don't know whether you have higher concentrations closer to the ground, or lower concentrations above a foot. You really don't know using that limited number of sensors what the maximum was. You can only guesstimate. And even at guesstimating, just by those sensors, and using the data that you have, it is very, very obvious that the amount that you intended to put on those plots was exceeded by a tremendous amount, up to five times what it should have been.

Q Doctor, do you consider it reasonable to raise the inference that median values of SO_2 are to be calculated by taking the experiment time times the upper top range in parts per million on a plot?

A The point here is simply the fact that if you wanted to make some estimate as to what those levels would be, you'll have to choose it somewhere along the line, and you could go to the very, very lowest level if you wanted to, or you could go to the highest level, or you could go to the median level, but it doesn't make any difference what level you go to, it's obvious that this is just the worst that can be determined from the data that you have there, and the situation, indeed, could be a lot worse than what has been represented.

Q It certainly could be a lot worse, especially in view of the fact that maximum doses were received for only eight minute periods.

A According to the data that you have with only a limit of four sensors.

Q Is that true?

A I have no knowledge of that. That wasn't in that particular data. That's something that you have privy to that I am not aware of.

Q Okay. Assume that the maximum doses lasted only eight minutes each throughout the period 24 May through 26 July. Now, that's about .008% of the time, isn't it?

A If you say so.

Q Okay. And then using your methods of calculation, which we have just discussed, the actual maximum doses in part per million hours would come as follows, wouldn't they? Let's go to plot A. The highest concentration is .0252; correct?

A That's correct.

Q And let's figure our hours, then. Experiment time. Assuming eight minutes, we would divide 60 into 8 to get .13, or 13% of an hour; right?

A If you say so.

Q Okay. When you multiply .0252 parts per million times .13 hours, what's your actual, maximum parts per million hours?

A Why don't you save me some mental --

Q .003?

A Fine.

Q Assuming that same set of assumptions, would you agree, then, that plot B would be .012; plot C would be .038; and plot D would be .045?

A If you say so, yes, I will agree to that, but I think it should be pointed out that, again, here you are going to exactly the same extreme that you accuse me of doing; in other words, you are just taking the very, very maximum values that have been recorded there. I wonder if, for example, you might know the next lowest value below that? Was it .2, .02 rather? And if so, how long that lasted? That could have been a considerable amount of time.

Q Assume it lasted eight minutes.

A Pardon me?

Q Assume it lasted eight minutes.

A Assume that it did?

Q Yes.

A Do you really know how long it lasted?

Q Yes I do. I'm telling you. I'm asking you to assume it.

A I can assume it if you say so, sure. I wonder if that is really the case.

Q You're aware of the phenomenon called fall green-up, Doctor?

A Yes, I am.

Q What is it?

A It's that period of time in the fall when there is increased moisture availability; plants have an extended growing period.

Q Do you have a copy of Dr. Gordon's testimony in front of you, page 23?

A Page 23? Yes, I do.

Q Okay. And then turn to Exhibit -- after you read that, take a look at Exhibit 227, which you have.

A Where do you want me to read on page 27?

Q Oh, starting on line 14, through 20.

A Now you want me to go to Exhibit 227?

Q Right.

A I don't have the actual colored photograph in front of me.

(MR. SHERIDAN HANDS PHOTOGRAPH TO WITNESS.)

Q You can use mine. What that photo shows is that on the treatment plots in areas where the drift occurred, green-up did not occur as it did in the other places; is that right?

A Not to the same degree on any of the plots, including the control plot.

Q It did occur on the control plot, however, didn't it?

A The control plot looks as though it is much lighter than the green-up areas in the surrounding region.

Q That's in your upper -- that's in relation to the other areas, right?

A I would say that the control plot is intermediate between the other areas and the high-level treatment areas.

Q Isn't the correct testimony of Dr. Gordon that SO_2 concentrations were not enough to cause detectable SO_2 levels at the control in vegetation?

A Well, he testified to the fact that the concentrations were low enough, or below detectable limits, for the analyzers that they had on the plots, and that's precisely the reason why I put the data where they did detect higher limits in my testimony, and those are the data that we've just been talking about.

Q And sulfur accumulation did not show excessive levels on the control, did it?

A As I recall, the sulfur accumulation levels on the control were less than the other test plots.

Q But the photo, Exhibit 227, shows that on the treatment plots and in areas where drift occurred, green-up did not occur as it did in other places in the same photo?

A As I've indicated, green-up also did not occur on the control plot as much as it has in surrounding areas; in other words, the control plot, even at that time, shows some effects in this photograph.

Q Yes, in other words, the control plot did respond?

A The control plot, very obviously, was affected by the experimental conditions, as were the buffer zones between each of the plots.

Q Is it your opinion, Dr. Edmonds, that SO_2 and NO_x will fall out of the Colstrip plume to the ground and stay there?

A Well, as I have indicated, the long-term maximum value of SO_2 coming out of that plant will be five ten-thousandths of a part per million. That is ground level concentrations.

Q And it got there by falling out, didn't it?

A If you want to use that kind of terminology.

Q Well, how'd it get there, then?

A It came from the plume that was disseminated from the stacks; in other words, the emissions of the plant. That is what the calculated values would be.

Q So we should say, probably, settled out rather than fall out?

A Whatever you prefer.

Q Well, it's a nuclear age. In truth, Dr. Edmonds, the composition of the atmosphere is a result of turbulence and the molecular motion of gases, right?

A I would say that the composition is affected by those parameters, yes.

Q If we put nitrogen, oxygen, and CO_2 in a cylinder and went away for a few hundred years, when we came back we wouldn't find three layers, would we?

A You would find after a period of time of 300 years that due to molecular movements, natural Brownian movements, that there would be distribution within that container of those particular elements.

Q Uniformly?

A I don't know. I have never run that kind of an experiment. I would assume that, according to the theoretical knowledge that we would have at the present time, that that would be the case, yes.

Q All right. The reason we play on dispersion and molecular motion is that people who want to use tall stacks want the dispersion so that by the time the plume hits the ground, the concentrations are more dilute; right?

A That is correct.

Q In the Taylor Creek studies, do you know what the pressure was in the lines?

A I don't recall right off-hand, no. I have read that and used that in some of my original estimates, yes. I don't recall the exact number.

Q You didn't know, then, that the pressure in the lines was only five pounds per square inch?

A That seems to be what I have read, yes. That's in the area.

Q If it was, then the gases would diffuse to the ground level?

A Well, what are you really referring to here? Are you taking my third point in the testimony?

Q Exactly.

A Okay. There you're comparing the differences between the pressures that you would have within the pipeline and distribution system, as compared with the lack of those pressures you would have after the gas has been disseminated over the area. I am simply making the point that in order to conduct an experiment of that sort properly, it is assumed and is common knowledge, that you would need an adequate baffle system in order to properly and thoroughly mix the two gases before its distribution even into those pipes. Now, I don't know what kind of a system, if any, was used. I've gotten the impression from cross-examination that none was used other than the direct mixing under pressure, of those two gases. In any case, the SO_2 air mixture of those gases, is heavier than the ambient air that would be present once they are released over the plots, and would have a tendency to fall to lower levels.

Q Are you saying, then, that at Taylor Creek, it only happened there?

A I'm saying that with the concentrations they used there, and the mixture that you had, that it is apparent that it did happen during the course of those investigations.

Q And since you know, then, and I assume you do, that SO_2 would not be preferentially pulled to the ground by gravity, you can't really guess that there was an additional or unrecorded increase, can you?

A I think it entirely reasonable to assume, as I have stated in my testimony for the reasons that I have given in my testimony, that since SO_2 itself is more than two times heavier than air, that with a gas-air mixture of SO_2 and air, that there would be a tendency for that to fall to the ground and that those concentrations at ground level, affecting the vegetation at ground level, would be higher concentrations than those concentrations recorded a foot above it by the sensors.

Q On Exhibit 226, Doctor, -- do you have that in front of you?

A Yes, I do.

Q In your comments, what do you mean by foreground?

A Would you repeat your question again, please?
Q On Exhibit 226, in your testimony you --
A You mean 226 of Dr. Gordon's testimony?
Q Right. In Exhibit 226, which you have there, which you're commenting on in your statement --
A On what page, please?
Q I think it's page 8. Page 8, line 23.
A Line 23?
Q Starting there.
A Yes.
Q What do you mean by foreground there?
A I mean the --
Q All that in front of the fence line?
A No. I mean the area right at the very bottom of the picture, that area that shows western wheat grass, Agropyron smithii, and the area that is included in the piping system, showing a little blue stem and silver sage, other vegetation types.
Q Okay. The uppermost limit, then, of foreground, by your definition in Exhibit 226, is that one pipeline about equidistant between the horizon and the fence line; right?
A That is correct.
Q Have you ever been on the Kluver family ranch?
A No, I have not.
Q The Duke McRae ranch?
A I've looked over that area but I've not been on the property, no.
Q Les Coates' ranch?
A No.

Q Wally McRae's ranch?

A I've looked over that area but I've not been on the property.

Q Streeter ranch?

A On all of these areas, they surround the Colstrip portion, and I have flown over them and observed those areas, yes, but I have not been on the actual property.

Q You flew over them?

A I have flown over them, and I have looked at some of them from a distance on the ground.

Q You don't think that a good way to look at the vitality of grazing lands is by airplane, do you?

A Well, actually, that is one method that is widely employed, especially with the use of photographs, infrared photographs, for example. That has been used in this study.

Q Oh, you endorse infrared photography, then, right?

A I think that infrared photography is a very good thing to have, but it is nothing more than another parameter, and there is nothing conclusive or definitive by its singular use.

Q It's one of those additional tools that a scientist would use?

A That's correct.

Q Did you use any infrared photography?

A Yes, I do.

Q Did you use it on any of these ranches?

A Have I used it for these particular studies?

Q Right.

A No, I haven't. I've used it in my own work quite a bit.

Q Have you ever worked on a ranch?

A No, I have not.

Q You don't come from the farm, then, I take it?

A I do come from a farm, yes, but not a ranch.

Q Okay. You know what winter pasture is, then, right?

A Yes.

Q That's when part of the ranch is grazed only slightly, if at all, during the summer so the cattle will have something to eat during the winter; right?

A That's correct.

Q And by your own statement, winter range is more susceptible than summer range; right?

A How do you mean by my own statement?

Q Starting on page 9, line 5.

A Yes.

Q Right?

A What about it?

Q If -- have you read it?

A I haven't read it but I'm aware of the contents of that paragraph, yes.

Q Are you stating, then, that winter range is more susceptible than summer range to SO_2 damage?

A The only thing that I'm stating here is that the conditions that are apparent in that photograph are conditions that show differences in that photograph which have resulted in micro-ecological differences between the two areas, as I have stated, and that in some cases, some of those differences, at any time of the year, would make the vegetation of that area more sensitive to SO_2.

Q Because they're ungrazed, they're more susceptible; right?

A No. It's not quite as simple as that. I've attempted to explain that in this paragraph. For example, because they are ungrazed, the relative humidity in those areas, ungrazed areas, is higher than you would have in those areas that have been heavily grazed, and because of the increase in humidity, as you well know, plants, as a general rule, are more susceptible to SO_2 damage than they would be if the humidity was lower.

Q That's right. You don't say that that test plot, then, was any more susceptible than the grazed portion above the fence line in Exhibit 226, do you?

A I do say that it is, indeed, more susceptible, because of the micro-ecological differences.

Q Okay. If, then, those are only winter pastures on these ranches, or other ranches, I assume, then, that they would be more susceptible than the grazed lands; right?

A In a relative sort of way, yes.

Q And in a relative sort of way, the grasses growing in areas where reclamation is being attempted, that have not been grazed, would also be more susceptible, wouldn't they?

A I think that I've identified, in fact, I know that I've identified, that particular fact in the original Colstrip report.

Q I'm interested in your comment here on page 9, line 15. You say no wonder apologies were offered when the photographs were first shown to Lt. Governor William Christiansen and area ranchers. What pictures are you talking about?

A It is my understanding that there was a meeting held at which the aerial photographs for these particular areas, as well as other areas, were shown to the Lt. Governor and to area ranchers, and it was at that time during that meeting that these apologies were extended.

Q You don't know, do you, that these pictures were, in fact, shown to Lt. Governor Christiansen?

A I don't know for a fact that these specific pictures were, but I am aware of the fact that similar pictures to them were.

Q Well, you can't categorically state that Lt. Governor William Christiansen saw any of these pictures, can you?

A As I've indicated, I know that these pictures were shown in his presence to the area ranchers.

Q These pictures? DNR Exhibit 226?

A Pictures of these same areas.

Q It's not DNR Exhibit 226, though, is it?

A To my knowledge it may not have been that specific picture, but as I've indicated, other pictures showing the same types of things were shown.

Q Who supposedly showed them all these pictures?

A I don't know specifically who.

Q Well, how'd you find out about it?

A Through two sources, both independently. One was through Mr. Bob Carroll, Robert Carroll, and the other was through Mr. Carl Anderson.

Q Bob Carroll's the fellow from Dunkle's outfit -- what's the name of it, Ecological Consulting Service?

A He is the person now presently in charge of Ecological Consulting Services.

Q And Carl Anderson's the man from Montana Power Company?

A He is the environmental manager of the -- at Montana Power, yes.

Q And you know, don't you, that neither one of those fellows took these pictures?

A I know that they didn't take those pictures. I know that they were present, though, at that particular meeting.

Q So they're just going out making apologies for everyone else, to your understanding, is that right?

A They didn't make any apologies.

Q Well, you can't tell me who showed them the pictures, if, in fact, they were ever shown to Lt. Governor Christiansen, can you?

A I do know from the information given to me by those two people, that they were shown in his presence to the area ranchers, and that apologies were extended.

Q You don't know whether it's DNR Exhibit 26, do you?

A I do know that if it was not DNR Exhibit 226, it was a photograph of the same area showing exactly the same conditions.

Q Do you happen to have that other picture?

A Pardon me?

Q Do you happen to have that other picture that shows exactly the same conditions?

A No, I was not privileged to receive a copy of that. In fact, I didn't even have the actual photograph for Exhibit 226 for any extended period of time, because only one was submitted.

Q This is sort of just a gratuitous remark on your part, isn't it?

A I think that it is the kind of remark that well shows that there is a sharp difference here, and one that was even noted at the time of the original submittal of those photographs, and the fact that there is a sharp difference, and the fact that there are many differences associated on a micro-ecological level, with the differences between the heavily grazed area and the experimental plots which are not grazed heavily, is enough to indicate that this is an experimental difference between what has occurred on those plots and what might be expected to occur over natural range around Colstrip. And that is the intention of that paragraph, simply to show that that difference does occur, and that the results obtained from these test plots are not representative of what might be expected over the natural range around Colstrip. That is precisely my point in that paragraph.

Q And of course that would militate to just gratuity, if, in fact, Lt. Governor Christiansen told us that he had never even seen this picture, or these pictures?

MR. PETERSON: Objection. That assumes facts not in evidence.

Q I'm asking to assume it.

A You're asking me to assume that?

Q Yes.

A All right. I'll assume it.

Q That'd make it gratuitous, wouldn't it, insofar as the Lt. Governor is concerned?

A I assume that it would, yes.

Q Let's go on to fluorides. Fluorides accumulate in vegetation, don't they?

A Fluorides, as with other substances, accumulate to various degrees in different types of vegetation. Some, a little bit; some, quite a bit. Fluorides in general, as it accumulates in vegetation, comes from relatively inert fluorides; in other words, fluorides that are tightly bound to other substances in the soil, and accumulation as a general rule, is very low.

Q Have you ever been around an aluminum plant?

A Yes, I have.

Q Then you know that you get pretty high levels of fluorides in that vegetation, don't you?

A Again, on a relative basis, depending on the kind of vegetation that is there, there is a distinct difference.

Q You're well aware that accumulation of fluoride in vegetation can have a very deleterious effect upon grazing livestock, can't it?

A That, again, entirely depends on the level of fluorides that you're talking about.

Q Okay. Let's take about 80 parts per million in vegetation, then, Doctor.

A We both are well aware of those levels that are those levels that are considered to be the maximum allowable, in other words, 35 parts per million.

Q 35 parts per million happens to be the state standard, doesn't it?

A That is correct.

Q And you're well aware, aren't you, Doctor, in your vast research, Dr. F. LeGard Shupe found adverse effects on dairy cattle at 29 parts per million in forage?

A Would you repeat that again, please?

Q Do you know Dr. F. LeGard Shupe?

A Yes, I do.

Q And you're aware, are you not, that in his studies, he found adverse effects upon dairy animals, cows, ingesting forage with accumulated fluoride levels of 29 parts per million?

A I'm aware of the fact that in those particular studies, there was a range associated with them, and that the range depended on the amounts and the type of vegetation that was consumed over a period of time, and that from those particular studies, a higher level was estimated to be safe for cattle, and that is anything below the 35 parts per million.

Q We just hurt them a little bit, not as much as we could, at that level; right?

A The point is simply that any organism that ingests vegetation that contains fluoride has some accumulation in the organism of fluoride resulting from that ingestion and digestion. Now, the levels that would be injurious completely depend upon how much is consumed, how much is contained in the vegetation, and the kind of animal that is ingesting and digesting it.

Q Okay. Let's take our cows, for instance. You know, don't you, Doctor, that a cow retains about one part per million fluoride from every 57 parts per million ingested in forage;

right?

A Those are numbers that have been used.

Q That excretion level is not equaled by grouse, pheasants, deer, antelope, insects, coyotes, or mice, is it?

A They would excrete more, in other words, higher levels.

Q They would excrete higher levels?

A Of fluoride, yes.

Q They would retain higher levels, don't you mean?

A No, I do not.

Q Are you telling me that a mouse excretes higher levels of fluoride than a cow?

A Proportionately, that is correct.

Q What do you mean proportionately?

A For the amount eaten, and the amount ingested, yes.

Q Whose data leads you to that statement?

A Well, I have given you the references that I have used. There are four of them. I have stated that in my direct testimony.

Q Tell me, who ever told you that mice excrete more than a cow?

A On a proportionate basis?

Q On a proportionate basis.

A That is in one of the references that I have used, I believe.

Q Well, I'd really like to know that reference.

HEARINGS EXAMINER: Let's take a recess while they're looking it up.

(RECESSED AT 10:38 A.M.)

Following a brief recess, the hearing reconvened at 10:48 A.M. on March 29, 1976.

CONTINUATION OF EXAMINATION OF DR. PETER R. EDMONDS

Rebuttal, Cross,

By Department of Natural Resources and Conservation,

By Mr. Sheridan (continuing):

Q Okay, Doctor, did you get that citation for me that tells me that mice excrete more in proportion than cows?

A The information associated with that particular question, I don't recall exactly or precisely how it was worded in the text of that reference, but the correlations between the two, I believe, to the best of my recall, come from the reference by Phillips on the effects of air pollutants on farm animals. That's in the Magill and Houghton and Ackley Air Pollution Handbook by McGraw-Hill Company, 1956.

Q Of the fluorides retained in forage by a cow -- let's say that one part per million out of 57 parts per million ingested -- what percentage of that one part per million goes to the bone?

A I would approximate, not knowing the specific number, but from what I'm aware of with humans, as I've indicated in my testimony, that approximately somewhere between 95% and 99% would.

Q Would you accept 99%? About 99% was retained by the bone?

A Yes, I think that's a reasonable figure.

Q That's because the fluoride ion likes bone; right?

A I'm sorry, I didn't hear you.

Q That's because the fluoride ion likes bone?

A If you want to be teleological about it you might say that.

Q Okay. And do you know where it is retained by bone? In the skeletal system?

A Most accumulation would be in the long bone systems, and then in the marrow of those systems.

Q In the crystal lattice, right?

A That's correct.

Q What's the function of the crystal lattice?

A In the long bones, the major function in that area is the production of blood.

Q Now, you don't have any studies to show that grouse excrete more efficiently than cattle, do you? Fluoride?

A Not as I recall, no.

Q And the same is true for pheasants?

A I know that for all of these examples that I've given, they are not as affected by fluorides as cattle. Cattle, it is a well-known fact, is the most affected organism on the animal from fluorides.

Q It has a lot to do with the amount of ingestion, rather than excretion, however, does it not?

A It has a lot to do with the rudimentary type of digestive system.

Q Have these other animals or fowl been studied, to your knowledge? Other than mice?

A You mean the ones that I've cited?

Q Grouse, pheasants, deer, antelope?

A That's why I cited them.

Q Do deer and antelope have the same rudimentary digestive systems as cows?

A Yes, they do.

Q They do?

A A similar type. They are ruminants.

Q They've got four stomachs, too, right?

A I don't believe that they have four, no.

Q Segmented, right?

A Pardon me?

Q The stomach is segmented?

A I believe it is.

Q Do you have any idea the number of cattle grazing within, say, ten miles of Colstrip?

A I don't recall a specific number.

Q Now, in your testimony, Dr. Edmonds, you mentioned the Department of Natural Resources' Exhibit 235, introduced into testimony through Dr. Gordon. You imply that there are several variables which may affect fluoride levels in mice, and therefore compound differences between mice populations; right?

A That is correct.

Q Have you ever visited with Dr. Gordon at the University of Montana to discuss sample handling and analysis for the determination of fluoride ion in bones?

A He has never afforded me that opportunity, no.

Q Have you ever asked him?

A As I've indicated before on my cross-examination, I've asked Dr. Gordon on several occasions to provide me in any way, form, or manner that he could see fit, with all of the information he thought would help me in my analysis.

Q Did you ever specifically request this information?

A What information are you referring to?

Q Sample handling and analysis for the determination of fluoride ion in bones of mice?

A Specifically on that, I don't recall having asked him any questions pertinent to that. The first time that I was made aware of these particular data was with this Exhibit 235, and I'm not sure whether he actually was asked during his cross-examination to provide the data for these particular analyses, as he was for many other analyses, but I thought that he had.

Q In any event, you don't have any of his data, nor have you discussed with him, so you don't really know whether there was any difference in the handling of these samples?

A All I know is the data presented in this exhibit, and my comments were made on the data presented in this exhibit.

Q Your comments were made just looking at the exhibit, but not having talked with Dr. Gordon or anyone else in his laboratory, or being familiar with any written information concerning the handling of those samples? In other words, you didn't study any of that additional stuff other than the exhibit?

A I have studied other analyses, and analyses similar to this, that were done in the Colstrip area. I do know that they were done by different individuals, and I do know that, having been done by different individuals, that the handling of those data would have another variable attached to them.

Q You don't know which variables Dr. Gordon had, do you?

A I don't know the many that might possibly exist, and that's why I pointed them out in my direct testimony.

Q So, you're just speculating, because you haven't talked with them, you don't have his data, and you're looking only at this particular exhibit; right?

A The comments that I made were specifically on the data as presented in this exhibit, and the differences in the data that is presented in this exhibit is obvious, and I have commented just on those data.

Q As you see it in the exhibit, without having talked to Dr. Gordon about the subject?

A Those comments are based on my analysis of this exhibit.

Q You know generally that biological data is skewed either high or low on a histogram, isn't it?

A I wouldn't say that, necessarily. I know that there is a great variability in biological data, and that a histogram analysis would show, depending on how it was presented, that type of variability.

Q Now you state that the average values for Billings on mice are closer to the average than the high values; right?

A Where are you reading, first of all, within my testimony? On what page?

Q Page 12. Starting about line 9.

A This is in reference, I believe, to Exhibit 235?

Q Right.

A And I've stated there that when comparing the two, that the lowest value for Billings is below the highest values of

Colstrip, and I've stated that the higher value -- let's find it here in my testimony -- just within Billings is much closer to the lower value for the entire Billings group.

Q Did you suppose that both populations could be skewed toward the higher values?

A I only took the data as it was presented in this particular exhibit, and I can see that there is a good cross-over between the two for both the Billings, as presented, and for the Colstrip.

Q Well, in fact, the high from Billings is about 2.7 times the average, isn't it?

A For Billings, the highest is extremely high. It is a very, very high value and I would initially conclude from looking at that kind of a value, that it is an anomaly; that it is a value that would rarely occur; and in looking at the lowest value, 3.56.6 for Billings and Laurel, I find that this is much closer to the average value of 890.2. In other words, there had to be, in order to get that kind of an average, many, many more values closer to that average than you would have for the higher levels as reported here, so that this reported high level was one that stands out as an exceedingly high level and should be treated just that way. I've also found that the lowest value for Colstrip, as well as the higher values, are well below the particular averages that you would have on a systematic comparison of the two, but that the higher values for Colstrip actually well-overlap those that would be associated for Billings.

Q The lowest value at Billings, although lower than the highest value at Colstrip, is still two to three times the average value at Colstrip, isn't it?

A Yes, it is.

Q Do you know where the Billings' mice came from?

A No, I don't. If it was stated, I don't recall specifically where they came from.

Q You don't know where the locations were, then?

A That's right.

Q And do you know whether or not there's any correlation between body weight and fluoride content in mice femur bones in any of the data?

A In these particular data?

Q Right.

A Well, I do know that depending on the methodology used for obtaining the weight of those organisms that there could be wide differences, as would be reported, depending upon, for example, the kind of balance used. If you just used a simple spring balance to obtain those data, then the data would be in error by a significant portion. Those kinds of balances are not very accurate. And when you're comparing them to very, very low levels, or slight levels, in proportion to that kind of a difference, you could see a wide difference in the data.

Q Do you know what Dr. Gordon used?

A I don't specifically know what he used, no.

Q When you compare the populations at Billings of mice, and the population at Colstrip, you have two separate populations with means differing by about a factor of 5, don't you?

A As presented here, yes.

Q And both are skewed rather high, aren't they?

A How do you mean skewed high?

Q High values are a long way from the mean?

A Well, I wouldn't say that that is necessarily the case for Billings, for example, because the lower values that you have for Billings is pretty close when you compare it to the higher value.

Q Well, isn't your high value 2.7 times the mean?

A Yes.

Q Didn't you just tell me that was an anomaly?

A I don't know whether it is or not. That, I've indicated, would be my first assumption, but I don't know whether, indeed, that is the case or not.

Q Well, in any event, the high at Billings is 2.7 times the mean, while the Colstrip highs range from 2 to 3.3 times the mean, don't they?

A But still, relative to the overall values, overlap, so that there is a similarity between the two populations.

Q One number overlaps; correct?

A There is an overlap, and that indicates to me that there -- for the amounts sampled, which is a relatively small amount, that there could be a much wider overlap in some other areas.

Q Well, there's only one number, in fact, that does overlap --

A In fact, there is an overlap.

Q One number.

A That is an overlap.

Q Just one, though?

A It is an overlap.

Q Is it one?

A Yes, it is one, and that one is a very definite overlap.

Q And the low at Billings is still 2 to 3 times that at Colstrip, right?

A Based on these particular data here, working on just average values, that would appear to be the case, but again, working with a population, it has been shown by these data that there is an overlap in those values between the two areas.

Q And doesn't that tell you that the populations are different between Colstrip and Billings?

A I would expect that there should be some difference in the populations between the two areas. I would find it unreasonable to assume that they shouldn't be.

Q Okay. Now, do you have Mr. Tourangeau's statement there with you?

A Yes, I do.

Q You made some comments regarding his testimony with respect to acid rain. Do you have it there?

A Yes.

Q Would you look at page 5, lines 8 to 28? Just review those for a moment.

(WITNESS COMPLIES.)

A Okay.

Q And the paper which Mr. Tourangeau refers to is the paper by Frohliger dated September, 1973, as shown on page 15 of his statement; isn't that right?

A That is correct.

Q In that experiment, the one reported in the paper of September, 1973 by J.O. Frohliger, was dry ice used in the study?

A As we have discussed during the time of my cross-examination on my direct testimony, I was not aware of that particular study at that time, but you brought it out and showed it to me, and, yes, dry ice was used during that study at Mount Storm.

Q So, really, it shouldn't be too puzzling, having looked at Mr. Tourangeau's statement, those lines 8 through 28 of page 5 and the citation to the '73 study, that dry ice was used, to you, should it, looking at the '73 study as a reference?

A Well, the reference that I originally cited in my direct testimony, and the one that was the subject of discussion over some other paper that had nothing at all to do with that particular reference for a 1975 Science article, simply did not include all the methodology, but Mr. Tourangeau had known prior to the time of writing this particular statement that, although dry ice was used during the 1973 study, those studies were repeated without dry ice, and as I've indicated in my testimony here, exactly the same results were obtained.

Q But Mr. Tourangeau in his statement, referred to the '73 study, didn't he, in which dry ice was used?

A That is correct.

Q In Dr. Frohliger's 1975 study, did he employ a sampling grid of 60 to 25 miles long with a sampler density as he did in 1973?

A I don't believe so.

Q Do you know what the pH values were?

A For what?

Q The '75 study?

A Yes.

Q What were they?

A They averaged in the range of around 4.6, I believe, as best I recall. I don't have that study right in front of me.

Q Is Frohliger's study at Mount Storm reported in '75 the same one as reported for Pennsylvania?

A How do you mean the same study? There were two separate studies that were done.

Q That's right. Is it the same one? Are the reports of the Pennsylvania study reported in his '75 study?

A The '75 study in Science was a report of those studies that he did around Pennsylvania, the Pittsburgh area.

Q In the '75 studies, did Frohliger use a titration curve?

A Yes, he did.

Q And did he conclude that the acid he measured was di-basic, having an equivalence point of about 8.3?

A Yes, he did.

Q And observed pK of between 6 and 6.3 as he did in '73?

A As I recall, that sounds right.

Q Essentially, you have just reviewed his study; is that right?

A I read his study in Science and I have talked to him personally on several occasions to discuss the study with him.

Q And it's without a doubt that Frohliger's work is the minority view?

A Dr. Frohliger's work is being viewed by many people at the present time as having significant value in the estimation of the components of acid rain. He is one of the foremost workers in the field of acid rain in this country, and all Dr. Frohliger has said, really, in that 1975 paper, is that, as everyone knows, rain is a very, very complex substance that contains many different species of chemicals and many different species of matter, whether they be chemically reactive or not, and that the major components that would influence the acidity of that rain need not necessarily be associated with strong acids, but could, as well, be associated with weak acid components.

Q You'll agree that the majority of the work on acid rains concludes -- and I'm talking about the work done in the United States, Scandinavia, Europe, Great Britain -- all conclude that acid rain is a serious regional and international environmental problem?

A There are many papers that have cited that acid rain can be a regional problem, given the specific set of circumstances. Even those people that have considered acid rain, such as Likens and Bormann, to be caused by strong acids such as sulfuric acids; admittedly, in their articles -- and I have one here that is a good example of that: "Acid Rain, A Serious Regional Environmental Problem," published in Science, Volume 184, in June of 1974 -- that they cannot account for, for example, the amounts of SO_2 in the air in relation to the acidity of rain. For example, in quoting from Likens and Bormann in that paper that was cited, they say that "present day precipitation contains about 70% less sulfur - less sulfur -

than that prior to 1950." And this drop in sulfur concentration at the sites that he was studying, at both Ithaca and Geneva, New York, is difficult to reconcile with the proposed recent increase in acidity.

Q Gee whiz, in the earlier years, what was the primary pollutant emitted into the air?

A How do you mean in recent years?

Q In the earlier acidity readings, how did they heat the homes?

A As I've indicated in my direct testimony, one of the reasons for this change, as also indicated by Likens and Bormann, is simply the fact that prior to that period they had heated homes with coal, and after that period they used extensively natural gas with low particulates; in other words, the decrease in particulates and the high sulfur associated with natural gas and oil increased some of the sulfate readings that were obtained. The point that I'm making here, and I think that it's a very important point for people to realize, is simply the fact that, not only in Likens' and Bormann's study, but indicated by many other people, as well as indicated in the DNR report, there is no direct correlation between the amount of sulfate in the atmosphere from whatever source, and the acidity of rain.

Q Did I ask you about sulfates?

A I thought that you had.

Q When you use dry ice around a rain collector, if that leaks into the sample, what happens?

A It would tend to increase the acidity of that sample through the formation of carbonic acid. Also, depending upon how the sample is handled, if you were to breathe into the sample at the time you took your pH readings, that could change the acidity and lower it because of the introduction of carbon dioxide, formulating carbonic acid.

Q Now I'll ask you something about sulfate, Doctor. You say that DNR incorrectly assumes in the final EIS that only sulfate and hydrogen ion are present in sulfuric acid solution. I can't find it in there.

A What page are you reading in my testimony?

Q Page 16, starting at line 14.

A Line 14, is that correct?

Q Yes.

A Yes, now what is your question, please?

Q Where do you draw the conclusion that DNR incorrectly assumes, or do you draw a conclusion?

A I have tried to reproduce the data presented in the DNR report, and as I've indicated on that one table, 10-31, in comparison to Table 11-16 on page 715, that the same methodology was employed for that, and that the methodology employed for Table 11-16 has assumed the concentrations, the calculated concentrations, that should be divided by 1.6. In other words, they're 1.6 for sulfur higher, taking only two rates of reaction instead of the four, and that for fluorides, they would be 4.8 higher.

Q Now, you're talking here about Table 11-16 where we're talking about pure aqueous solutions of hydrochloric and sulfuric acids; right?

A That is correct.

Q Where can you derive the statement that DNR assumed that only sulfate and hydrogen ions were present, from that table?

A By the numbers that they have obtained it is obvious that they only have taken into account the total summary reaction associated with those dissociations, instead of it breaking down into each one of the species-specific dissociations that would occur. In other words, when H_2SO_4 dissociates, the first dissociation that would be involved would be the breakup of the hydrogen ion, and then bisulfate, and then the bisulfate for a second dissociation would break up to hydrogen ion and sulfate ion.

Q Do you know how the numbers in Table 11-16 were generated?

A From the text of the DNR report, and from the equations given in the DNR report, it is implied that they have been generated using the summary reaction, and using the numbers and recalculating the numbers by that particular assumption, I get exactly the same numbers that are reported here in the DNR report.

Q Is sulfuric acid a di-basic acid?

A Yes.

Q What is the dissociation constant for the first hydrogen ion? Or is the first step totally dissociated?

A The first step is not totally dissociated. The K-1 dissociation constant is approximately 38 for the first dissociation. The second dissociation is approximately 1×10^4.

Q Well, isn't it 1.2×10^{-2}?

A For the second dissociation?

Q Yes.

A I said approximately.

Q Well, that's a little bit different than 10 times --

A 1×10^4?

Q 1×10^4. Well, that's a little different than 1.2×10^{-2}, isn't it?

A The reason for that is that you have an incomplete association, or dissociation, so that you do have remaining in any given solution of that sort, an undissociated species, namely sulfuric acid, undissociated sulfuric acid. You're assuming here complete dissociation, and in no mixture of that sort would you have complete dissociation.

Q What percent dissociation do we obtain in this second step?

A Very little. Most of it is in the first step.

Q It's above pH 5, isn't it? About 99%?

A Yes, that's right.

Q Would that lead you to conclude that the DNR did not assume that only sulfate and hydrogen ions were present when the table was prepared, Table 11-16?

A Would you repeat that question, please?

Q Would that knowledge, assuming that is what has happened, make it clear that the DNR did not empirically assume that only sulfate and hydrogen ions were present when that table 11-16 was prepared?

A I'm not sure that I understand your question. From the way that you've worded it, it's got several negatives in there. I wonder if, perhaps, you might reword it so it's a little bit clearer to me?

Q Well, maybe I can shorten it up here. You're not trying to imply that only one-half the H_2SO_4 is dissociated, are you?

A No, certainly not.

Q But you don't know what the extent of this dissociation will be if all pH values are greater than zero?

A I don't know exactly what that would be, no.

MR. SHERIDAN: Nothing further. Thank you.

HEARINGS EXAMINER: Mr. Graybill?

Rebuttal, Cross, by Northern Plains Resource Council,
By Mr. Graybill:

Q Dr. Edmonds, you're with Westinghouse; is that correct?

A That is correct.

Q Well, I've read your first sentence of your second paragraph with great admiration, where you say that you've carefully and objectively re-examined the evidence. I find that hard for even me to do and I appreciate the fact that you've done so. What is it that made your re-examination of the evidence objective?

A I am a scientist, and in using a scientific approach I endeavor whenever possible, no matter whom I might be employed by, to use an unbiased and objective approach. I've used that since the initiation of any of the studies associated with this project, as well as any other projects that I've worked on, either in the university system, or at Westinghouse, or in any other place of employment.

Q Okay. Now, with that basic assumption, let's turn to the second to last paragraph in your statement.

A Where are you specifically?

Q Page 21, line 16. Let's go to line 18.

A Okay.

Q You say that the fluorides, or the expected gaseous emissions from the Colstrip plant are not expected to adversely affect vegetation of fauna. Not expected by whom?

A By me, sir.

Q Oh. Your statement is stated in such a general way that it seemed to me to be completely objective and to include everybody. You don't mean to include everybody there?

A I think it's very obvious from reading this testimony, as well as other testimony that I presented, that the conclusions therein are my conclusions, and that they are based on the best available information that I would have from experts in each one of the fields that I have cited in the testimony.

Q All right. Now, right there you seem to me to be terribly inconsistent. They're either your conclusions or they're everybody else's conclusions. Are you trying to say that everybody says that the plant isn't going to adversely affect vegetation and fauna?

MR. PETERSON: Objection. Repetitious. He just answered the same question.

HEARINGS EXAMINER: Sustained. He said they're his conclusions that he's given based on the information he got from others.

MR. GRAYBILL: Mr. Hearings Examiner, it just, you know -- I've sat here for two hours this morning, and I realize that your time is valuable and the hearing is valuable, but to be struck down with that kind of a ruling when --

HEARINGS EXAMINER: Well, ask him another question. You and I aren't going to argue, Mr. Graybill, our time is valuable, so ask him another question.

MR. GRAYBILL: But I've sat here and heard repetition upon repetition --

HEARINGS EXAMINER: We ought to have heard enough of it by now, so ask him another question.

MR. GRAYBILL: But don't get on my back about it, because I don't repeat too much, sir.

HEARINGS EXAMINER: Well, don't get on mine either, pal.

MR. GRAYBILL: Okay, pal.

Q Are you saying that all of the people -- you know, in your sentence just a moment ago, Dr. Edmonds, you said that it was your conclusions, but at the same time you said, and including all of the studies of all of the people you'd done, and what I'm trying to discern, and what Mr. Peterson, I hope, will let me discern for the record, is whether this conclusion here that the plants are not expected to adversely affect vegetation is really yours, or whether you're really ascribing that to other people.

MR. PETERSON: Same objection. Repetitious.

MR. GRAYBILL: All right, now, before you rule, if you're going to rule against me, I'd like to be heard.

HEARINGS EXAMINER: I'll overrule, but I'm going to sustain it if you keep arguing.

MR. GRAYBILL: I'm not arguing, sir, I'm trying to ask questions. I have a right to --

HEARINGS EXAMINER: I understand it, but don't interrupt before I get a chance to rule, Mr. Graybill. I've --

MR. GRAYBILL: Well, I certainly want --

HEARINGS EXAMINER: -- overruled the objection; now let him answer the question.

Q Good. Now let's see if we can get an answer, Mr. Edmonds.

A Would you repeat your question?

Q No, I won't. Don't you remember it? I'll have it read to you.

A I'd like you to word it specifically, as you have before, so that I may give you a good evaluation and response.

Q You said in your last answer before we got interrupted by Mr. Peterson, which I think was a marvelous device, that the conclusion drawn here on line 18 was your conclusion, but then you went ahead in the latter part of your sentence and included all the other scientists that you'd read and studied, and, in other words, you tended to broaden the conclusion from your own and ascribe it to many others. Now, I want to know if the conclusion that this plant is not expected to adversely affect vegetation and fauna is yours, or if you are ascribing it to others?

A The conclusions that I've stated in my testimony are my conclusions, as I have stated that they were, and that these conclusions of mine are based on an analysis of my studies, the studies of other experts, widely-recognized experts in the field, not all of whom agree, and that have given various interpretations of their data. I've looked at these, objectively analyzed them, and have come to the conclusion that the overwhelming majority of response, not only of these investigators, but also supported by my own investigations, leads me to my own personal conclusion that I have stated in this testimony.

Q Well, these other investigators didn't investigate the Colstrip situation, did they?

A They investigated subjects that have arisen, or subjects that are related to, the Colstrip investigation.

Q They investigated the subject matter, but they didn't investigate the Colstrip situation; isn't that true?

A Taking into account all the investigations, those directly and indirectly associated with this particular study, and all the subjects associated with the study, I have formulated these conclusions.

Q Good. Now I think we're becoming objective, Mr. Edmonds. I want to ask you about that next sentence there. It says short and long-term gaseous emission concentrations will be lower than those known to injure plants. What are the levels that are known to injure plants, Mr. Edmonds?

A I have cited those levels on numerous occasions, not only in this particular statement, but in my direct testimony, and also in the Colstrip report; I have given tabulations of those specific species and the levels that would affect them.

Q And does this injury occur -- does it jump into effect at some particular level?

A For any vegetation there is a threshold level associated with that particular species.

Q And below the threshold there's no injury at all?

A Well, fluorides, for example, it has been definitely shown on a number of different and separate examinations that the amounts of injury is directly and linearly proportional to the amount of dose.

Q The amount of what?

A Dose.

Q So in other words, it's actually an arithmetic progression, then, isn't it?

A The fact is that you do not get any adverse effects whatsoever that can be detected unless you get observable injury at those extremely high levels, levels which are much higher, orders of magnitude higher, than what would be expected or calculated for the normal operation of the Colstrip plants.

Q How do you observe the injury?

A These are from visual observations of vegetation. Usually, that is associated with leaf damage.

Q Is there the possibility of injury to plants without observable leaf damage?

A As I've indicated using fluorides, for example, there is a linear response in that there is no injury that is able to be detected until you have observable damage to the leaves.

Q There's no such thing as the plant just not growing as well?

A I think that depends on the specific plant that you're talking about, as well as the pollutant.

Q Well, but you haven't made it depend. You've made a general flat statement here.

A Well, I think as far as the Colstrip area is concerned, and as far as one of the pollutants that seems to be one of the ones in question, or at least one of the major ones in question, that as far as the studies done, as I've cited on the ZAP plots, that there is no distinguishable difference in productivity on any of those plots, and those that have received extremely high concentrations, unreasonably high concentrations, and those that have not received such high concentrations, and the control plot which shouldn't have received any, but indeed, did. Between those, and among those plots, there is no discernible difference in productivity.

Q Over what period of time?

A Over the period of time of 2,900 hours of continuous high level fumigation.

Q And so, as a scientist, you're saying that there isn't any difference, there's no such thing as plants not growing as well without leaf damage? I just want your scientific opinion, Mr. Edmonds; I'm not a scientist.

A I'm just citing the example of that ZAP plot study which showed precisely that.

Q So, as a scientist, you're saying that there is no such thing as the plant not growing as well; that any damage or injury is going to be observable?

A I would say as an objective opinion, as a scientist, that there has been no correlation made, to my knowledge, as to long-term chronic effects that actually would affect plant productivity, or other chemical reactions with metabolic reactions within the plant at low levels of air pollution.

Q Have there been any attempted?

A Yes, there has been. In fact, there's been a recent document put out by the federal government on chronic effects, and it has stated that in that document.

Q Are you saying that the federal and state air quality standards afford such a margin of safety that if we stay above those, or below those limits, that there'll be no injury to the plants in the Colstrip area?

A From the overwhelming amount of information that we have on that particular subject at this time, that is indeed indicated, yes.

Q Are you familiar with the Acorn Report?

A Yes, I have read it.

Q Well, in the Acorn Report, they list 12 different cases where it's been demonstrated that damage to vegetation occurs at sulfur dioxide concentrations which are below the federal standards. Now, if you're familiar with it and have examined it objectively, I take it you know about those 12 cases. Are you saying they're all wrong?

A Have you looked closely at what particular vegetation types they're talking about?

Q I've looked at quite a few of them closely.

A Would you name a few of them, please?

Q Well, I don't really want to name them for you. I'd be glad to show you the study.

A Well, as best I can recall --

Q You said you were familiar with it -- wait, wait a minute, I haven't asked the question, Mr. Edmonds. You said you were familiar with it. I want to know whether or not you're saying that the 12 examples stated in here where they say there has been demonstrated vegetation damage below the federal and state standards, I want to know whether you think that they're all wrong?

A I don't think they are necessarily wrong. I think that there needs to be a more thorough investigation relative to the actual effects observed for those particular species cited. But, for example, one of them, I believe, as best I recall -- it's been a little while since I read that particular article -- is bell three tobacco, which is one of the most sensitive species, for example, to SO_2 and ozone pollution that exists. Now, if those are the kinds of references that you're talking about for those particular types of vegetation, they have absolutely no relationship to the Colstrip area.

Q I don't see that in the report, Dr. Edmonds. That wasn't what I had reference to. I was concerned with alfalfa and with oats.

A Alfalfa, again, is one of the most sensitive species and it has been shown, for example, that with alfalfa --

Q Sir, would you let me ask the question before you give the answer. That way the answer might have more relevance to the question?

A Fine.

MR. PETERSON: I don't know whether there's a question and answer, or just a dialogue.

MR. GRAYBILL: Well, I don't intend to dialogue, Mr. Peterson. Maybe Dr. Edmonds does, but I don't. I'd like to ask the questions.

MR. PETERSON: Why don't you ask the question and we'll speed this thing up, then? It's pretty difficult at times to understand when he's asking a question and when he isn't, but why don't you wait and see?

MR. GRAYBILL: It won't be difficult for a scientist of Mr. Edmonds' --

MR. PETERSON: That's my own personal opinion.

MR. GRAYBILL: Okay.

Q The plants that I'm interested in, Dr. Edmonds, are alfalfa and oats and barley. I skipped over radishes, but those are plants which I'm sure you would agree with me are likely to be found in the Colstrip area; right? That's the question.

A They could be found, under some circumstances, such as, for example, reclamation, could be found in the Colstrip area.

Q You mean --

A I'm not finished with my answer, please. These particular species that you have cited, as I used in the case of the example of tobacco, are some of the most sensitive species to the air pollutants that we're talking about, and even at those particular levels below the state standards that you have cited, which is not necessarily documented through extensive study, the levels that would be associated with the operation of the Colstrip units are far below even those levels, ridiculously far below, and I would like to repeat at this time, if you were to make the assumption that you could get any kind of long-term effects from levels that are so ridiculously low as five ten-thousandths of a part per million, for example, of SO_2, then those assumptions that you would make would be completely erroneous. There's no reasonable way that you would be able to equate any type of injury, both long-term or short-term to those kinds of levels.

Q Now, Dr. Edmonds, I don't know whether you understand the way this game is played, but I get to ask you questions and you're supposed to answer the questions, and your answer is supposed to be germane to my question. Now I asked you a question about whether alfalfa and barley and oats were likely to be found in the Colstrip area, or whether you thought they were. That's a pretty simple question. But you gave me an awful long answer that ended up with whatever it was you wanted to put on the record that had nothing to do with what I asked. Now, I'd like to ask you in all candor and fairness to please answer my questions, and I'll try to get rid of your cross-examination quickly. But I'd like you to just answer my question. Now, let's try again. Do you know whether alfalfa and barley and oats are products likely to be found in the Colstrip area?

A As I indicated in my previous answer, these particular species would be found in small amounts around the Colstrip area, mainly through the efforts of reclamation.

Q You mean to tell me that reclamation is the main reason that alfalfa is grown in the Colstrip community?

A When you speak of the Colstrip community, I am referring to those areas immediately around the plant.

Q Well, how far does the noxious gas go, Dr. Edmonds?

A Well, as I've indicated before in previous testimony, the area of maximum deposition, for example, would be in a ten mile radius about the plant.

Q Well, there's been another witness who says that it goes a great deal further, on the applicants' side, but let's limit it to a ten mile circle around Colstrip. Are you telling me that alfalfa is grown in a ten mile circle around Colstrip only for reclamation purposes?

A No.

Q Are you telling me it's grown principally for reclamation purposes?

A I'm saying that that is one of the places that it would be used.

Q Wouldn't it be really foolish of the applicants or Western Energy to use as a reclamation plant, within ten miles of the Colstrip plants, a plant that you say is particularly sensitive to SO_2 emissions?

A The plant that I'm saying is particularly susceptible to SO_2 emissions, namely alfalfa, which does grow around in the Colstrip area, outside of those areas that would be used for reclamation, is susceptible at levels that would be much higher than those levels that would be associated with the operation of the Colstrip units.

Q Well, and that's what I'm trying to get around to addressing, whether there isn't some gradual rising of the damage done to alfalfa, or whether it springs into being above the federal and state levels?

A Well, let me say this, based on studies that have been done specifically with alfalfa, that until there is a 5% surface damage of the leaves, there is no demonstrated metabolic deleterious effect, there is no demonstrated decrease in productivity, that is, anything above 5% damage of the leaves, and the reason for this, as you would find in almost all vegetation, is that there is a photosynthetic reserve, a reserve capacity of these plants to manufacture and store food above which they would normally have. So even if you were to obtain deleterious surface effects on the vegetation, utilizing high levels, levels that are much higher than would be associated with the Colstrip operation, you still would not get a decrease in productivity.

Q And is this the type of product of susceptible grass that you would recommend that they use to reclaim land in the Colstrip area?

A I find no difficulty in using that particular species, or genus, because it is beneficial not only to the ground supplement for the nutrient base that you would need, but also the fact that there would not be any problem associated with the Colstrip operation on those particular types of vegetation because of the ridiculously low effluent levels.

Q Well now, Doctor, I'm not a scientist, but I have been in Montana and farmed a little alfalfa, and one of the reasons you're not going to be able to use it on the reclamation is you're not going to be able to get the water to it. Have you ever thought about that? How does it grow without water? Have you got any good ideas about that? Alfalfa, now?

A Yes. It has a specific function, a specific purpose, and I guess that I can't expect you to be all that knowledgeable about what its purpose or function would be relative to reclamation, but I will explain it. It is just used during a one seasonal period of time. It is not expected to continue growing. It is just used as a soil supplement for that particular time.

Q You haven't explained to me yet, even as a simple lawyer, how you're going to get it to grow that one year without water.

A Well, as programs have been formulated for reclamation in the Colstrip area, they have had plans for irrigation for a one year period, and that was done, and it had planned to be done on more extensive plots as research to stabilize soils for the first year until other vegetation could be established.

Q Doctor, you have just whetted my appetite. You mean to say that there are plans to irrigate the reclamation so that the alfalfa will grow at Colstrip?

A The suggestion had been made approximately a year and a half ago that some reclamation plots be established utilizing that particular technique. Indeed, some plots had been established that did utilize irrigation from water trucks.

Q Where are they going to get the water for the water trucks?

A I have no idea. From wells in the area --

Q Well, I don't either -- excuse me.

A -- or from the Yellowstone River. I have no idea where --

Q I haven't either --

A -- the water specifically came from.

Q -- because I've read the great Westinghouse report from cover to cover and there's nothing in there about taking water from the Yellowstone River to irrigate. Now, if that's what we're going to do, we have a whole new ball game here. Are you telling this board that there is a plan by these people after they get this approval to somehow take more water than they've applied for in this case from the Yellowstone River and put it out on the mine spoils watering your alfalfa for a year; is that what we're going to do with the water from the Yellowstone River, Dr. Edmonds?

A I think that it should be clearly stated that you are the one that has said that, not me.

Q I beg your pardon, sir, I have not said that at all. You have said that there's a plan to water alfalfa for one year on the reclamated project, on the reclamated coal lands at Colstrip. Now, if that's so, I want to know the source of that, because that's absolutely new information, and I'm very interested, and my farmers are, in the water. Where do you get that information, Doctor?

A Well, that isn't absolutely new information. If you had read the --

Q Well, it wasn't in the Westinghouse Report, sir.

A I'm not finished, sir. If you had read the Colstrip report from cover to cover you would have seen in there reference to that kind of a situation. I don't recall exactly what page it would be, but it would be in the reclamation section.

Q Can one of you get my Westinghouse report in the back room? We'll let the doctor find it. You mean that there's a plan to take more water than they have agreed?

A I did not.

Q Oh, they're going to do it with the same water?

A I never said that there was a plan to do that; I never implied that there was. I simply said that they have used reclamation plots in the area that have been irrigated, either through water trucks or plans for other types of irrigation. Now, that's as a reclamation test study plot, and it has nothing at all to do with the overall reclamation procedure, and it was just a suggestion, and not, certainly, an overall plan for that area. I never said that it was. You did.

Q Well, I certainly didn't say it, Doctor, and if that's an example of your objectivity and your carefulness with facts, I'd have to say you've just destroyed a good deal of your credibility.

MR. PETERSON: I'll move to strike that gratuitous comment, Mr. Graybill.

HEARINGS EXAMINER: Yes, I'll strike it.

Q Okay, Doctor, show me where in the Westinghouse report it says that they're going to take water from the Yellowstone River to irrigate alfalfa plots?

A I never said in that report anything at all about taking water from whatever source. When you asked me what source, I said I didn't know.

Q You did say, sir, and I'll challenge the record on it, you did say if I'd read the Colstrip report; now I trust you're from Westinghouse, you're talking about the Westinghouse Colstrip report. If that isn't it, identify the Colstrip report which does say that they're going to take water from the Yellowstone River to irrigate alfalfa on the soil spoils down there.

A I think you had better review the record, because let me lay out for you exactly what was said. You asked me where the water would be coming from, and I clearly said that I did not know. You said, well, what sources could it possibly come from, and I said I didn't know, it could be who knows, wells, or perhaps even from the Yellowstone River, who knows. Now, that's what was said. You're the one that implied that it would be definitely coming from the Yellowstone River, above and beyond what would be normally be applied for. You're the one who said that, not me.

Q Well, I'm really not trying to say where it comes from, because I didn't even know about it. I'm asking you where it's coming from?

A I don't know where they got their water, but they have used water on their plots. That's something that they have already done, and mind you, these are test plots; they are studies that are funded by Western Energy Company, by EPA.

Q Do you have a study that shows that they're going to use alfalfa as a product to rehabilitate the land down there?

A Alfalfa has been used, I believe, on those plots.

Q Don't you understand the question?

A No, I guess I don't.

Q I said, do you have a study that shows that they are going, in the future, to use alfalfa down there? Is there some study or something you're referring to?

A I know that in the overall plans that they have developed, that they had used alfalfa, and that they intend to use it on other plots in the future.

Q Who are they?

A Those are the studies being conducted by Dr. Hodder.

Q Hodder?

A Hodder.

Q And he intends to use alfalfa?

A As one of the components.

Q Do you have a copy of Hodder's study?

A Not with me.

Q Is it in evidence, to your knowledge?

A I have no idea.

Q Will you furnish me with a copy of Dr. Hodder's study, and mark in it where he says that they're going to use alfalfa and water?

A I can show you in there where they have used it. I can show you in the Colstrip report where it has indicated that.

Q What do you mean, the Colstrip report?

A This report right here.

Q What are you tapping?

A The Colstrip Generation and Transmission Project Environmental Analysis.

Q All right. That's what I've asked you to do, to show me in there.

A Okay.

Q Get busy.

WITNESS: Do you want to take a break while I do it?

HEARINGS EXAMINER: All right. We'll recess until 1:30 and you can look it up. Can you find it faster than that?

(OFF THE RECORD BRIEFLY.)

MR. GRAYBILL: Mr. Hearings Examiner, maybe we could give the witness over noon to find that, and he could start with that at the end, and let's go ahead with some of the other matters.

HEARINGS EXAMINER: That'll be a good idea. Thank you.

Q All right, now, on page 2 of your statement, Dr. Edmonds, on line 11 you say the highest levels of SO_2 calculated to be produced by all four Colstrip units are far below the federal and state standards. Calculated by whom?

A These figures that I have cited here are figures that have come from the findings of fact and conclusions of law.

Q Well, you know, one of the applicants' earlier witnesses, and one that was on perhaps longer than any other, Mr. W.L. Faith, did some calculations, and in his conclusions, he says there are two borderline cases: one for one hour SO_2, and one for fumigation. Did you completely ignore in your objective study of the record, Dr. Faith's testimony that there were some close cases?

A No, I did not, as far as overall effects are concerned.

Q Well, when you say that the highest levels are far below the state and federal standards, you're not agreeing with Dr. Faith's Exhibit 103A, are you?

A Have you asked the question?

Q Are you?

A I am taking the numbers that are presented from different calculations, in other words, the maximum amounts from those calculations in the findings of fact and conclusions of law. Those are the numbers that I've cited in this testimony.

Q Well, but it says here, the highest levels calculated.

A That's correct.

Q That wouldn't be any average; that would include --

A The highest average level. That is how it is so stated.

Q Well, what I'm trying to find out is, did you ignore, then, Dr. Faith's testimony?

A No, I did not.

Q Well, he's got some levels that are so high that he says that they're borderline, and you say that there aren't any anywhere near. Now you can't both be right, and I'd like you to explain that.

A I'm talking about the overall effects on vegetation, and --

Q No, you're talking about the highest levels of SO_2. Now let's be specific. I'm talking about the first four words on line 11.

A The highest levels of SO_2 that are calculated for the Colstrip units for a one hour basis, a twenty-four hour basis, and the annual average, are all well below those levels that would be injurious to biota.

Q Well, then, you must not be aware that in Exhibit 103A, Dr. Faith calculated that there was a very close case on the one hour SO_2 concentrations; is that so?

A I have taken that into consideration.

Q Well, how can you take it into consideration and use the term highest levels? He has calculated a high level; whether he's right or wrong, I don't know. We tend to disbelieve him, but how can you account for it, and then say that there isn't any such thing, that nobody's calculated a high level, when here is one in 103 calculated?

A The way that I've considered those particular things, are the -- or those levels -- are the time factor for occurrence, in other words, duration of occurrence, and also the frequency of occurrence for those particular concentrations.

Q That sentence doesn't say anything about time and frequency.

A That's right.

Q It says that you didn't find any high levels that were anywhere near the state and federal standards, and I'm telling you that one of the other witnesses did, and I'm asking you, did you ignore him, and you say no, and I said, well, explain how this man can calculate a high level and you've got some other people that calculated not-so-high levels, and you say that there weren't any high levels.

A Again, I can only repeat the intention of that particular sentence. I have taken into account those levels that have been recorded by Dr. Faith, and I have taken into account the levels that I have cited here, as this being an introductory sentence for this particular paragraph which I cite specifically what levels that I have used in my calculations.

Q I understand that.

A That these are the ones that I have considered to be the maximum levels from the findings of fact and conclusions of law. Now, as far as effects are concerned, --

Q Wait a minute. Let's not get into effects yet.

A -- I've taken into account his calculations, and I find that still there will be no deleterious effects.

Q Doctor, let's not get into effects. What you've really done is that in the second sentence you've taken the ones you decided to take, but in the first sentence, you make a general statement, and you really only mean those that you intend to use; isn't that what you mean?

MR. PETERSON: I'm going to object to this as being repetitious. The witness has explained now on three occasions what he meant, and the levels which he has used in his testimony.

HEARINGS EXAMINER: Well, I'll overrule. If he has any further explanation, he can make it.

Q All I'm really testing here is not whether there are high levels or not, Doctor, I'm testing your credibility, because you make a statement that is a flat out statement that there aren't any levels very near the state and federal standards, and yet you say you have considered one of the witnesses' exhibits which does find some levels near there.

A That is correct.

Q So, I'm only testing your credibility, sir, not your mathematics, or your scientific knowledge.

A Well, relevant to my credibility, then, let it be said that I have considered Dr. Faith's levels, as well as the other levels associated with the findings of fact and conclusions of law, and in the determination of my conclusions, which is the purpose for writing this particular testimony, to come to some conclusion based on all this available evidence, I find that there will be no deleterious effects.

Q Now, the other thing that strikes me as curious about line 11 is that it uses the term calculated. Is there a better way of finding out what the levels of SO_2 will be at Colstrip than calculating them?

A How do you mean a better way? I'm not quite sure of what you want there.

Q Well, I don't want to lead you, or suggest a way. I'm asking you, as a scientist, if there's a better way of finding out what the levels of SO_2 emissions will be in the Colstrip area, than calculating them. I asked Dr. Faith the same question, and I'd just like you to think about it.

A I'm not aware -- do you want me to think about it, or give you an answer?

Q Well, I'd like you to think before you answer. Let's put it that way.

A I am not aware of a better method that could be used in the Colstrip area other than building a plant and taking a gee whiz approach and saying, just look, see, gee whiz what happened, type of a situation. Without building a plant and having to predict what is going to happen there in that area not having an operating plant, that is the best way that I know of of being able to determine what those levels would be.

Q Doctor, I certainly agree with you; without building a plant, calculating is the best way you can come up with an answer. Have you been to Colstrip?

A Yes, I have.

Q How recently?

A Oh, I would say a couple of months ago was the most recent time that I --

Q Then you must have noticed that they have built two plants down there?

A I know that one, anyway, is operating.

Q You know, I'm sure, that two will be operating soon, don't you?

A Yes.

Q Now, knowing that 1 and 2 were built, is there a better way of finding out the SO_2 that that coal and that amount of product produces, than by calculating it at Colstrip?

A Well, you can monitor the plant that is in operation at the present time and see how it compares to the calculated levels.

Q I see.

A And, as I understand it, that has been done, and the levels that actually have been obtained from actual monitoring, show that those levels are far below even those predicted.

Q Doctor, in your eagerness to get your facts into the record, you have certainly stated what has happened so far, but surely as a scientist you wouldn't agree that the first tests the first month or two are really the final answer, would you?

A Well, I would say that they are indicative of what you might expect to occur --

Q Surely, surely.

A -- but, of course, there could be fluctuations.

Q And, of course, they really couldn't measure adequately a one year standard, could they?

A They would give you a very good indication as to what you might expect over that year's period of time.

Q Are you familiar with the fact that the wind blows in different directions at Colstrip at different times of the year?

A Yes, I certainly am.

Q So, how are you going to predict which way the wind's going to blow so that you can make, from a short analysis, a long-term prediction?

A This has already been done in the formulations of those calculations and the determination of those calculations.

Q You agree with me that testing will be a superior method to finding out the SO_2 concentrations to calculating?

A Well, even with testing, although there are some definite benefits, yes, from testing, I would find that you have to make certain assumptions because testing it for short periods of time with different concentrations that you're dealing with, again, you have to make predictions; again, you have to upgrade it to an unknown situation.

Q And, Doctor, don't you have to make certain assumptions when you calculate?

A Of course. And in these calculations, I think that it should be pointed out that these assumptions that are made are extremely conservative assumptions.

Q And you could make those same kind of conservative assumptions if you measured instead of calculated, couldn't you, Doctor?

A Yes, you could.

Q Okay. Now, on page 4, you talk a little bit about fumigation, and you talk particularly about dose, and now I'd like to talk with you about this function of time that you mentioned a while ago. How much of the time do you expect fumigation to take place at Colstrip?

A I'd like to have a clarification, if I may, as to what you mean by the word fumigation?

Q Well, let's start with you; you're the scientist. What is fumigation?

A Fumigation, to me, is allowing a very, very high level, or high concentration, of a particular gas, in this case, one of the effluents that you are wishing to test, to affect the biota or a specific type of vegetation, let's say, for an extended period of time at those high levels.

Q Well, Doctor, by that definition I'd have to agree there's never going to be fumigation, or very seldom, because you said a very, very high level of something to affect plants. That isn't what I understand fumigation to be at all, and I had a witness on the stand for two hours who's an expert in it, and he was brought by the applicants. Fumigation, as I understand it, Doctor, so that we understand each other, is when the plume, because of heat from the ground rising up and mixing, and the colder, upper air coming down to replace the heat that's rising, the exchange of hot and cold air brings the plume down in contact with the ground. And when that happens, there are elements that are in the plume that get on the ground in higher concentrations than normal. Now, that's what I understand fumigation to be. Isn't that fumigation?

A Well, what you're talking about here is the different interpretation of fumigation depending upon whether you're talking in terms of meteorological aspects, or whether you're talking in terms of biological aspects. There is a difference.

Q Well, I'm talking about meteorological.

A Now, in meteorological aspects, there you could have a fumigation of that sense lasting for an extremely short period of time, and in fact, usually it does. And then, only under unusual circumstances that do not occur very frequently over a year's period of time.

Q I'm asking you, meteorologically now -- we're talking about the same kind of fumigation now, aren't we?

A Okay.

Q I'm asking you how often you would expect it to occur in the Colstrip area?

A I don't recall right offhand what the figures were for that determination, but they were, I think, four times, if I recall correctly, over a period of a year, that you would have a fumigation condition. The number might be even less than that.

Q Where did you get that idea?

A I don't recall just where I got that information from. It might have been from Dr. Faith's testimony; it might have been from the Colstrip report. I could look that up if you like.

Q The applicants brought a witness here who's an expert on fumigation. His name was Crowe. He isn't a doctor. And he said in the transcript on page 3347: Question. Do you have any opinion as to how often - that's my question about fumigation - -- I'll go back a question. Now, did you find circumstances at Colstrip that would lead you to believe that there would be fumigation; is that right? Answer. I believe there would be. Question. Do you have an opinion as to how often? Answer. I'm not sure I stated here, but I think it's a fair concept that it would be probably at least half the days would have some form of fumigation. Do you disagree with Mr. Crowe who they brought as an expert on fumigation? You say it'll be four times a year.

A You say, half of the total days?

Q That what Mr. Crowe said, not me. If you'd like, a little further down on the page, on page 3347 --

A I'd like a definition of what he considered to be fumigation.

Q I said, and you estimate that at least 50% of the days it could occur? Answer. It could, yes, in some form.

A In some form. I'd like to know, really, what he mean by fumigation. I would not like to try to interpret his words.

Q He meant just what I told you. He's the one that explained it to me. It's when hot air near the ground goes up and it forces the cold air up to come down and replace it, and that brings the plume in contact with the ground.

A So you have plume contact at ground level for 50% of the time?

Q Well, Doctor, that's not what I say, that's what the expert that was brought here by the applicants said on June 14th -- July 14th, 1975.

A Well, again, I can only repeat I'd like a clearer definition from him as to what he really meant by that, and what he really calls fumigation, because even under those circumstances, if you're going to maintain low levels at five ten-thousandths of a part per million for SO_2, for example, then it certainly couldn't be what would meteorologically termed a very important fumigation episode.

Q Well, Doctor, I'm not really testing whether it will or it won't; I'm testing your credibility as against another witness' here as to whether or not you understand fumigation, and that's all I'm trying to do.

HEARINGS EXAMINER: Do you have much more, Mr. Graybill?

MR. GRAYBILL: No, just a couple more questions.

Q Over what area do you expect fumigation to occur in the Colstrip area?

A As I've indicated prior to this, on many occasions, the area of maximum deposition would be in one location approximately ten miles south of the plant. That is the area of maximum impact.

Q Well, here's what Mr. Crowe had to say on page 3350 of the transcript: Question. When this happens and the plume lays over and is more or less horizontal at the effective stack height, can fumigation take place anywhere for the next mile, two miles, five miles, ten miles? Answer. For twenty miles, thirty miles, or forty miles. Then a little later I say: Question. So what you're really going to get in fumigation is a big long swath through the area which is measured width-wise by the width of the plume and lengthwise by the length of those conditions prevailing; isn't that right? Answer. Well, the conditions prevail, generally, over the whole surface of the earth, and that vertical exchange is taking place everywhere, not just where the plume is. And then the question: What you're saying is it is going to exist just as far as -- until the plume finally dilutes itself out so that you can't hardly measure it? Answer. The process of vertical mixing takes place on beyond that. It takes place in Chicago and New York and Europe. Do you disagree with Mr. Crowe?

A I find that Mr. Crowe, from that kind of a statement, tends to exaggerate a little bit, especially in the context as I have interpreted the findings of fact and conclusions of law. I find that it is a little bit difficult to sit here and compare what we were talking about prior to this, associated with fumigation, and that particular statement, and know whether he's really equating the same type of circumstances.

Q Well, Mr. Crowe was talking about the circumstances at Colstrip, and you're talking about the circumstances in the findings of fact and conclusions of law; is that it? Of the Board of Health?

A With respect to what?

Q Fumigation.

A With what I've written in my statement, or with what you are just asking me now?

Q Well, you know, I just asked Mr. Crowe where the fumigation's going to take place, and he said from the point of the plant, as wide as the plume, to New York or Europe. Now, I'm asking you -- if you agree with that, and you told me that you agreed only with what was in the findings of fact and conclusions of law, as I understand it.

A No, I didn't say that.

Q Oh, what did you say? Do you disagree with Mr. Crowe?

A I have utilized Dr. Faith's testimony in his estimation of fumigation.

Q Do you realize that Dr. Faith told me in answer to a question I asked, that as far as fumigation was concerned, he was a novice and he depended on Mr. Crowe?

A I was not aware of that.

Q So, to sum it up, you based what you say in your statement here on what you found in the findings of fact and conclusions of law, not on what you found in the record from the witnesses who were brought here by the applicants to talk about fumigation; isn't that true?

A From the findings of fact and conclusions of law, from Dr. Faith, from the original studies done on the Colstrip report, and from the studies that have been done by meteorologists in the Department of Environmental Systems at Westinghouse, those are the type of things that I have based my conclusions upon.

Q Well, but Dr. Edmonds, on line 12, you say, I have carefully and objectively re-examined the evidence presented both before and after my initial testimony, and Dr. Crowe is that evidence, so you must have ignored Dr. Crowe; isn't that what you did? Or never read him?

A I don't recall having read those particular statements.

Q Okay. So, your objective re-examination of the evidence was at least limited; is that correct?

A In that one specific instance, it might have been. As I indicated, I don't recall having read those particular statements.

Q And, of course, that's an incidence on which you base about 13 pages of your statement here, isn't it? Fumigation?

A No. The things that I have already described to you, that I've based those 13 pages of my statement on, are those areas of evidence that I have obtained and I have already identified their sources.

MR. GRAYBILL: Well, thank you, Dr. Edmonds, for your analysis of the record.

HEARINGS EXAMINER: Now, did you find that excerpt in the Westinghouse report, or have you had an opportunity?

WITNESS: No, I haven't yet.

HEARINGS EXAMINER: Mr. Peterson, do you want to wait for your redirect until after lunch?

MR. PETERSON: Yes.

HEARINGS EXAMINER: All right. We'll adjourn until 1:30.

(RECESSED AT 12:15.)

Following the luncheon recess, the hearing reconvened at 1:26 P.M. on March 29, 1976.

CONTINUATION OF EXAMINATION OF DR. PETER R. EDMONDS

Rebuttal, Cross, by Northern Plains Resource Council

By Mr. Graybill (continuing):

Q Dr. Edmonds, what have you found in the Westinghouse report?

A Your reference before to the question as to whether alfalfa would be used, or at least was planned to be used, at the time of the writing of this report for the reclamation activities.

Q And does it say that alfalfa is planned to be used?

A Yes, it does.

Q What page is that?

A It cites it in the text on page 2-29, right hand column, the second paragraph from the bottom, middle of that paragraph, in parenthesis, it cites "cicer milkvetch, alfalfa and clovers are the four et cetera for stabilization of soils." And the variable on page 2-30 on a table listed, "Plant Species to be Used During Reclamation of Western Energy Company, Rosebud Mine," alfalfa is listed in that table almost in the middle, a little bit above the middle portion of that table.

Q And is it your testimony that even though alfalfa is a plant which you have characterized as very susceptible to SO_2 influence that alfalfa is a good plant to use to rehabilitate the soil?

A Yes, it is. It's a good plant to use for the specific purpose that it was intended to be used for, and that is to increase the nitrogen content of the soil for a brief period of time, during which that time it would also function to stabilize the soil.

Q I think the real question that we asked you to look up in the Westinghouse report was where they were going to get the water to irrigate the alfalfa they were going to use?

A Right. That was the other question and that I have not been able to find yet in the Westinghouse report, but I know from my own recollection of discussing that particular issue, that it is either contained in this report or that in one of Dr. Hodder's reports which I used as a basis for what I have in the Colstrip document on this particular section, that that particular experimentation was used.

Q You don't know whether they intended to depend on rainwater or depended to bring in water?

A Well, the studies that were conducted at that time were just to see what the effect of artificially introducing water would be. In other words, using some type of an irrigation system, but that was a matter of just studying what that effect would be rather than planning on implementing it over a long period of time. I remember discussions about that at the time that it was not looked upon as a favorable thing by anyone concerned, whether it be the Department of State Lands or Dr. Hodder or anyone else associated with the reclamation program, or if that be the type of reclamation that might be depended upon or that would be utilized over a long period of time. It was the kind of a thing that they were experimenting with for a short-time basis, just for the initial stabilization and development of the first year's planting.

Q But since there is new land every year being developed, that would require irrigating so many acres every year when they get to reclaiming the land, right?

A Only if you chose to go that route, yes. There was, in other words, some thought about doing that and there was no decision certainly made that they would, and there was much talk about the adverse use or adverse effects that would result through the use of irrigation.

Q Well, there was talk about that?

A Oh, yes.

Q Was there talk about the limited capacity of the storage ponds?

A Yes.

Q There was talk about that? Nevertheless, there's a possibility that some of that storage pond water will be used to irrigate alfalfa?

A No, I didn't say that. I said at that time that there were discussions about that possibility. I don't know at this time whether there's any possibility or whether it's looked upon unfavorably or favorably.

MR. GRAYBILL. All right. Thank you.

HEARINGS EXAMINER: Redirect, Mr. Peterson.

Rebuttal, Redirect, by Applicants

By Mr. Peterson:

Q Dr. Edmonds, is it still your opinion that neither the short nor long-term exposures to the calculated SO_2 concentrations from the Colstrip generating units which you've used in your direct testimony and again in your rebuttal testimony are expected to produce significant effects on vegetation, wildlife, humans or domestic animals?

A My opinion is exactly the same as stated in both my direct and rebuttal testimony.

MR. PETERSON: I have no further questions.

Rebuttal, Re-cross, by Department of Natural Resources and Conservation

By Mr. Sheridan:

Q Dr. Edmonds, it's your opinion apparently in response to Mr. Peterson's question, that there's going to be no effect on humans. Are you a trained medical doctor?

A No, I'm not.

Q Are you a trained veterinarian?

A No, I'm not.

Q But you're free in your willingness to give those opinions, aren't you?

A From the information that I have cited already in my testimony and based on that information that I have cited, yes, that is the opinion that I have expressed.

Q Without holding degrees nor taking training as a veterinarian or a doctor, correct?

A As I've indicated to you on prior occasions, I've never purported to be a veterinarian or a doctor or to have special capacities in that way.

Q We'll agree with you on that.

MR. SHERIDAN: Nothing further.

HEARINGS EXAMINER: Mr. Graybill.

Rebuttal, Re-cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Yes, I have just one question.

MR. PETERSON: It had better be pertinent to redirect, or I'm anticipating an objection.

MR. GRAYBILL: Well now, Mr. Peterson, let's handle your anticipation. As I understood it, you asked him as a question on redirect, whether, based on his previous testimony and after the cross-examination, he still didn't believe that SO_2 would have no bad effects on plants, and it seems to me that opens the door pretty widely.

MR. PETERSON: I don't know if it would make any difference if it did or not.

MR. GRAYBILL: Well, the question I want to ask is kind of a simple one, Jack, and I think you ought to listen to it.

Q You cited there page 2-30 and the chart there that contains a list of plants that were tried in the reclamation tests, to which your Westinghouse report referred?

A That's correct.

Q Now, looking at the list of plants, you'll see that some of them contain a little dagger or cross in front of them, and some of them an asterisk?

A That's right.

Q And some of them contain nothing in front of them. Can you tell the board what the little cross or dagger and what the asterisk there for that purpose means, what it signifies?

A Well, that's explained as a footnote below the table, down at the very bottom of the table, and the dagger indication means that those are plants that have demonstrated through experimentation, on particular study plots at the Rosebud mine, that they grew well during reclamation programs there. The asterisk indication there means that those are species which are just native to Montana; that's the only thing that that is meant to imply.

Q And as I understand it from looking at the chart, alfalfa was not shown as a plant that was native to Montana?

A That's correct.

Q Was it shown as a plant that grew well in the tests?

A No. At that particular time when this list was first developed alfalfa had not been used that much in the test programs, but was intended to be used in later programs and as my understanding has been used -- has been used quite effectively since the time of the writing of this report.

Q The report does not show that alfalfa had grown well?

A It doesn't indicate that it has not grown well, either. It was something that was planned to be used as the table has indicated, plant species to be used during reclamation at the Rosebud Mine.

MR. GRAYBILL: That's all.

MR. PETERSON: That's all, Mr. Davis.

HEARINGS EXAMINER: You are excused, sir.

(WITNESS EXCUSED)

HEARINGS EXAMINER: Call your next witness.

CAL CUMIN, called as a rebuttal witness by the Applicants, having been first duly sworn upon his oath, both as to his written testimony and as to the oral testimony to follow, was examined and testified as follows:

(THE WRITTEN DIRECT TESTIMONY OF MR. CAL CUMIN WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATEMENT OF TESTIMONY

OF CAL CUMIN

My name is Cal Cumin and my place of business is 1925 Grand Avenue, Billings, Montana. I am a planning consultant and own Cumin Associates, a general planning consulting firm. Because proper planning often necessitates the use of many professions, I have associated, or am currently associated, with other firms which can provide such expertise as engineering, architecture, earth sciences, computer modeling, etc., which a particular job may require. I have a bachelor's degree in political science from California State College, Fullerton, California. I am an associate member of the American Institute of Planners, a member of the Montana Association of Planners, a member of the Montana Technical Council, and a member of the Technical Advisory Council of the Mid-Yellowstone Area Planning Organization.

I have been working in the rural planning field in Montana for over six years, first as a research planner with Intermountain Planners, Inc., of Billings, eventually as one of the owners of that firm, and now with my own firm. My work experience ranges from facility needs planning for Montana's small communities to county comprehensive planning programs to providing planning services such as subdivision and zoning ordinance administration to small communities which do not have a full-time planning staff. I have prepared comprehensive plans for Baker and Hardin, Montana, and for Musselshell and Big Horn Counties (which included three more small, incorporated communities). My firm is presently preparing a comprehensive planning program for Wibaux County and is assisting in a similar program for Rosebud County. All of these community and county areas are, have, or probably will be experiencing some impacts from the development of energy fuels. The various planning programs have included those factors which affect the planning decision-making process by local governments such as area history, land use, resources, socioeconomic profile, recreation, transportation, housing, social services, and utilities.

My work has also included the preparation of environmental impact statements, environmental impact assessments, and such specialized research as part of the preparation of a profile of the construction worker employed at large, energy development projects such as at Colstrip, Montana, San Juan, New Mexico, and Emery, Utah.

My firm, Cumin Associates, has been retained by Rosebud County since November 1, 1975; we were hired to assist the Rosebud County Planning Board and the Rosebud County Planning Coordinator in the preparation of a comprehensive county planning program and in the administration and application of planning practices to currently existing or expected planning-related problems as they occur in the county. The jurisdictional area of the Rosebud planning program is the unincorporated area of Rosebud County (with the exception of trust lands of the Northern Cheyenne Indian Reservation) and the City of Forsyth; such jurisdiction includes the area of Colstrip.

When my firm was hired, Rosebud County had previously adopted countywide subdivision regulations pursuant to the Montana Subdivision and Platting Act of 1973 which were administered by the local planning board and the planning coordinator. The Rosebud County Commissioners had also adopted, October 1, 1973, an interim zoning resolution regulating land use on six sections of land in and around Colstrip; this resolution was in effect for one year, at the end of which the County Commissioners extended it for one additional year. The City of Forsyth had also adopted subdivision regulations and administered a zoning ordinance within its corporate limits. In 1973 the Northern Cheyenne Tribal Council had obtained some planning funds from the U. S. Department of Housing and Urban Development and prepared a limited socioeconomic analysis of potential coal development on the Northern Cheyenne Reservation. Other planning-related, preparatory, local activities prior to the hiring of my firm in Rosebud County included an extensive resource inventory of the county and its communities conducted and compiled by the county planning coordinator. It should be noted that this resource inventory, which included various socioeconomic projections for the planning area, could, with the addition of some land use plans and capital facility data, be considered a comprehensive plan for Rosebud County and its communities, given the lack of precise definition of such term (comprehensive plan) in Montana law. Further planning work in the county includes a soil survey and mapping program which is now about 50 percent complete. Also, the county joined with other adjacent counties and formed the Tongue-Yellowstone Area Planning Organization (APO), a U. S. Environmental Protection Agency-funded and promoted organization concentrating on local activities which affect or which may affect water quality. In addition to the specific water quality research being conducted by this APO, county-wide land use is being mapped and sewage facility plans are being prepared for Forsyth and the community of Rosebud. It should also be noted that the county planning program assisted in the preparation of sewage and water facility plans for the community area of Ashland in 1975. All of these general county planning activities are in addition to the intensive planning work done in the Colstrip townsite by various counsultants which was detailed in previous testimony by Jim Spring. The extensive park planning project started in Colstrip two years ago by Wirth Associates has received an approximately one-half million dollar grant from the federal Bureau of Outdoor Recreation which is just starting to get implemented.

The first step taken by Cumin Associates after being retained by Rosebud County was an evaluation of the county-wide subdivision regulations.

Under the Montana Subdivision and Platting Act of 1973, all counties in the state were mandated to adopt subdivision regulations within a certain period of time after which the state would impose a subdivision regulation on the locality if the latter had not adopted such within the time period allowed. Basically the subdivision law brings under state and local regulation developments in which any division of land is under 20 acres in size and which includes mobile home and travel trailer parks. Generally, the state law requires that an environmental assessment be prepared for such subdivisions which will evaluate the impact of the proposed subdivision development on everything from existing vegetation and wildlife to sewer systems and schools.

This subdivision regulation is extensive and is, presently, the major land development control tool available in Rosebud County. As such I wanted to make sure it was well defined and current. Additions were subsequently recommended to and passed by the planning board to strenghten and facilitate the environmental review process of new subdivisions. The same action was taken with regard to what is commonly referred to as House Bill 666. This piece of legislation, which became law last year, requires that approval of any subdivision be contingent upon a written finding of public interest by the governing body; subsequent refusal by the local government to approve a subdivision based on the lack of public need prohibits development of the subdivision. This statute alone, without any other controls, allows a local governing body to control new subdivision developments based on evaluation of public need for that particular development as they see it. Finally, provisions were made to add to the subdivision ordinance requirements to insure subdivision development compliance with recently adopted Montana Department of Health and Environmental Sciences (DHES) administrative regulations (MAC 16-2.14(10)-S14340). This administrative code requires further review and approval by the DHES of all subdivision plans including detailed, final construction drawings of water, sewer, and solid waste disposal systems in addition to the basic plats and environmental assessments. This same scrutiny and approval-denial authority was also extended to most certificates of survey under 20 acres in size which, if limited to one parcel of land, are largely exempt from the state Subdivision and Platting Act. The review and approval-denial authority of state government—through the Department of Health and Environmental Sciences—has now permeated local land transfer activity to such an extent that if a farmer wants to sell an acre of his land to his son to build a home on, a complete survey, water system plan, sewer system plan, and environmental review must be submitted to the state DHES prior to the family being allowed to commence any land transfer activity; in addition, the farmer must pay a fee to the DHES for the review. This fee, in the case of large subdivisions, amounts to thousands of dollars and is over and above the local review fees imposed at the city-county level for plat administration, advertising, hearings, etc. No matter how proficiently and stringently subdivision laws are enforced at the local government level, the State DHES still requires complete re-review and approval by that agency far away in Helena, Montana.

With the state promulgated, local subdivision administration requirements, as adopted and enforced by the City of Forsyth and Rosebud County, the local governing bodies have good control over all development activity which constitutes a subdivision as defined in state law.

Those new construction and development activities, such as erection of a service station facility or a bar-restaurant complex, which cannot be defined as subdivisions and which occur in changing or growing communities, can be approached—from a land use review or control perspective—through zoning. The Rosebud County Planning Board is currently considering a form of land development review in the county area utilizing county zoning enabling statutes in state law. The area of jurisdiction for the proposed land development control is that county area south of the Yellowstone River and north of the Northern Cheyenne Reservation, including Colstrip; the area excludes Forsyth and includes a small portion of the county east of the Cheyenne Reservation but north of the Custer National Forest. The zoning as proposed is an interim measure designed to slow nonsubdivision-type development which could occur in prime areas such as the Colstrip Road-Interstate 94 interchange, the immediate proximity of Colstrip, and the roadway area anywhere between Colstrip and Forsyth. A more permanent land development administration ordinance is currently being prepared by my firm, and will be ready for the required public review process within three months.

Another planning-related activity undertaken in January of this year by Rosebud County was the completion of a population census to determine the number of people currently living in the county. Besides providing critical information for such purposes as revenue sharing and various other grant applications, the resulting census information provides the most current population information possible for planning purposes in the formulation of a socioeconomic baseline analysis for the county comprehensive plan. This baseline study is currently being prepared by my firm and will consist of a computer model which will allow programming of various socioeconomic data to determine estimates of probable future economic and population scenarios for Rosebud County and its communities including Colstrip. A draft of the baseline analysis should be completed within four months.

The full scope of the overall comprehensive planning program as approached by my firm for Rosebud County is included as Attachment One to this testimony. The outline is not an official document or hard and fast guideline; rather, like the nature of planning itself, it is flexible, dynamic, and is adaptable to changing conditions in the county or to changes in the priorities of problems as perceived by the local decision makers.

In addition to the past and present planning-related programs initiated by either the state or local governments in the Rosebud County area, the Montana Legislature, at its last session, passed a law usually referred to as House Bill 672 and officially entitled "An Act Establishing a Procedure for the Economic Development of Montana Through Local Government Control, Based on Land Growth Patterns Established Through Economic Value as a Supplement to Zoning with Economic Inducements and Penalties; Providing Authority to Local Governments to Develop Planned Development Procedure; and Providing Standards of Land Usage; and Providing an Effective Date." As indicated by the title the bill is very complicated, but it essentially mandates land use planning at the county area level. The status of H. B. 672 is presently rather vague, but its existence probably best exemplifies that if state government-mandated land use planning is not already a reality in Montana then its realization cannot be too far in the future.

One of the greatest potential assets available to the local units of government in Rosebud County in dealing with current and expected growth and change is the existence of coal tax funds available on a grant basis. Rosebud County has been designated by the Montana Coal Tax Board as an impacted area; such designated areas are directed by law to receive half of the impact monies to be distributed by the Coal Board, a total figure for which has been estimated at eleven million dollars for the 1975-1976 biennium. Local governments in Rosebud County, including school districts, have already applied for about five million dollars in grant funds for such projects as improvements to water and sewer systems, streets, recreation facilities, schools, and to help lower bonded indebtedness. Further, approximately $6.5 million of the coal tax funds have been set aside (over and above those included in the funds distributed by the Coal Board) for matching with federal funds for impact area highway construction and improvement; the road south from Interstate 94 to Colstrip is included in this improvement program.

- In addition to coal tax funds, the Old West Regional Commission has made available $30,000 for planning activities in Rosebud County on a two-year basis. Other funds have enabled the county to hire a resident sanitarian who lives in Forsyth. The sanitarian reviews and inspects plans and existing facilities for sewage treatment, solid waste disposal, water systems, etc. and greatly assists specific planning—related activities in the county including the areas of Colstrip, Forsyth, Lame Deer, Ashland, and Rosebud.

The process of governing the milieu of growth and change in Rosebud County has changed slowly and will continue to do so. This response, though slow, is felt locally to be appropriate as it is careful and cautious. The slow change in governing processes is prompted by the great changes occurring in the county and by the burgeoning federal and state regulations that threaten to overwhelm local governments; this latter has been a necessary ingredient to the change. The tools for implementing sound planning are now available in and to Rosebud County, and it is doubtful whether additional state or federal land use policies and regulations will expedite planning programs useful to local governmental decision makers given the current level of rural social attitudes.

PLANNING PROGRAM
-ROSEBUD COUNTY-

I. Natural Resources and Community Facilities and Services Inventory

A. Natural Resource Inventory

1. Air Quality
2. Water Quality and Quantity
3. Agriculture
    a. Livestock
    b. Farming
4. Silviculture
5. Minerals
6. Wildlife
7. Scenic
8. Vegetation

B. County and Community Facilities and Services Inventory

1. Education
2. Library
3. County and Municipal Administrative Office
4. Streets, Sidewalks, Transportation and Parking
5. Storm Sewer and Flood Plain
6. Fire and Police
7. Hospital and Health
8. Social Services (Public and Private)
9. Recreation
10. Public and Private Utilities (Gas, Power, Water, Sewer)
11. Planning
12. Government
13. Housing

C. Existing County and Community Land Use--Level 2 Classification

D. Land Capability and Constraints

1. Topography
2. Ownership
3. Land Value
4. Soils Analysis (septic capacities, bearing capacities)
5. Geologic Hazards
6. Flood Plains
7. Meteorological (wind)
8. Fire Hazards

Attachment One

E. Federal and State Energy Policies and Roles

- 1. Major Legislation
- 2. Major Programs
- 3. Services
- 4. Funding

F. Citizen Participation

- 1. Public Meetings
- 2. Surveys
- 3. Media Programs
- 4. Ad Hoc Committees

G. Historic and Archaelogical Resources

- 1. Identification and Evaluation

II. Population and Economic Baseline and Projection for Rosebud County and Population Centers

A. Economic and Population Data Collection

B. Economic/Population Base Analysis

C. Alternative Developments

- 1. Market Analysis
- 2. Federal and State Policies
- 3. Citizen Participation
- 4. Development of Alternative Scenarios

D. Population and Employment Growth Analysis

E. Selection of Most Likely Scenario

F. Growth Area Identification

III. Evaluation of Most Likely Scenario

A. Relative to Information Gathered in Section I

B. Based on Specific Growth Area Analysis

C. Social Factors

D. Citizen Participation

IV. Refinement

(If necessary, repeat Item III under different growth area assumptions)

V. Community Service and Facility Planning Tasks

A. Projected Needs

1. Land Use
2. Housing
3. Transportation
4. Public Facilities
5. Social Services

B. Federal and State Policies and Roles

C. Citizen Participation

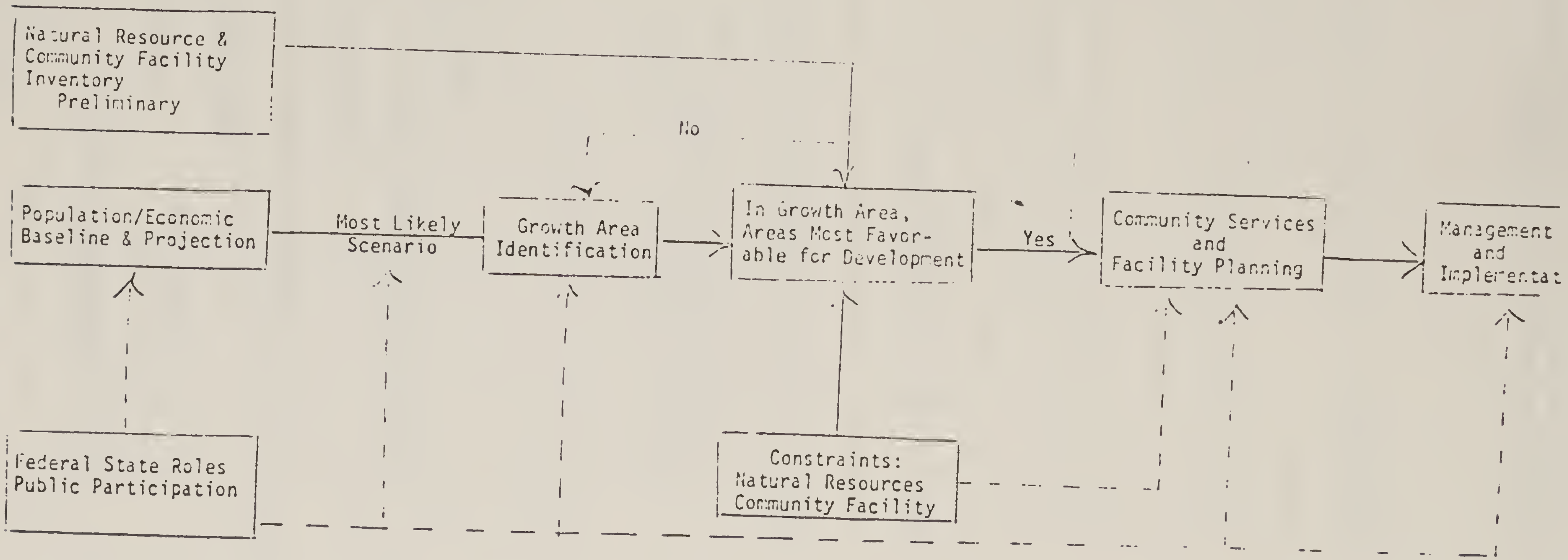
VI. County Development Strategy

A. Rosebud County and Community Specific Plan Formulation

B. Implementation Financing

C. Private and Governmental Responsibilities

D. Citizen Participation


Natural Resource &
Community Facility
Inventory
Preliminary
Population/Economic
Baseline & Projection
Most Likely
Scenario
Growth Area
Identification
No
In Growth Area,
Areas Most Favor-
able for Development
Yes
Community Services
and
Facility Planning
Management
and
Implementat
Federal State Roles
Public Participation
Constraints:
Natural Resources
Community Facility

EXAMINATION OF CAL CUMIN

Rebuttal, Cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Mr. Cumin, I only have a few questions for you today, sir.
Can you tell us first, sir, for the record, how old are you?

A I'm 31.

Q And you are an associate member of the American Institute of Planners; is that correct?

A That's correct.

Q In the scheme of the American Institute of Planners, one may become an affiliate member, then an associate member, and finally a full-scale member, right?

A Yes.

Q Right. Now, in your statement of rebuttal testimony, Mr. Cumin, at page 3, you refer to a planning-related, preparatory local activity prior to the hiring of your firm as an extensive resource inventory of Rosebud County and its communities. Do I understand that an effort was made to adopt some zoning ordinances in Rosebud County without first having had public hearings?

A Are you referring to a specific time?

Q At any time prior to now, sir.

A No attempt was made, no.

Q Is there not a court order that has been entered requiring the holding of public hearings before the adoption of zoning ordinances countywide?

A Yes.

Q And that court order was entered, was it not, as a result of an effort to adopt the ordinances without the public hearings?

A Yes, it was.

Q All right. So as I understand, therefore, the state of the process now, the folks are at work to prepare the necessary input so that the hearings can go on and the hearings should be going on right about now, shouldn't they?

A We hope to start the hearings shortly, yes.

Q All right. And that's for the purpose of getting local input on the proposals that are made so that thereafter evaluation of the local input can be made in order to make further proposals for adoption by the decision makers, right?

A Right.

Q If you'd flip back to page 2 of your statement, Mr. Cumin, at line 21 you state that the Rosebud County Commissioners adopted an interim zoning resolution regulating land use on some sections of land in the Colstrip area, and that was October 1st, 1973, renewed for one year. As I calculate, that would take it up to October 1, 1975; is that right?

A Yes.

Q What happened after October 1, 1975?

A The adopted interim zoning regulation became noneffective.

Q Okay. The role that you have played in Rosebud County is as a result of your firm having been retained to assist the Rosebud County planning board as of November 1, 1975; would that be correct?

A Yes.

Q And would it be correct to say, Mr. Cumin, that as of the present moment as the result of the work that you have done, there is not yet any comprehensive county plan that has been adopted; is that correct?

A I'd have to ask, what do you mean by a comprehensive county plan?

Q Well, is there no definition of a comprehensive planning document in Montana?

A I don't believe so, no.

Q I see. Is there any tool for comprehensive planning in a single coordinated document for county government?

A There are some recommendations and there are some examples of work that has been done in the state and in other states and localities.

Q Have you participated in such work, sir?

A Yes.

Q Have you actually formulated comprehensive planning documents yourself?

A Yes.

Q Has that been done in Rosebud County?

A No.

Q The nature of the work, as I understand it, in which you are engaged, is to provide tools which then could be used for the purpose of devising some appropriate county plan; is that correct?

A No.

Q Are you not engaged in the process of trying to develop tools so that planners and decision makers can use them?

A Yes.

Q And would a result of the development of those tools enable people who chose to do so to adopt a comprehensive planning document?

A Perhaps.

Q But not necessarily, right?

A Right.

Q Okay. So as I understand your testimony then, Mr. Cumin, the way you see development in the Rosebud County area, would be to go from tool development, a task in which you are engaged, to the possibility of the development of an overall comprehensive planning document; would that be true?

A You seem to be using the comprehensive plan as a product that I'm reaching toward, and this is not true. Planning as being administered by myself, or being assisted by myself in the county, is a continual process of providing decision making tools to the people that have to make decisions, not necessarily a comprehensive plan.

Q I understand, and your mandate does not include the preparation of a comprehensive document for planning purposes in Rosebud County?

A No, it doesn't.

Q But your mandate does include the preparation of tools which others could use if they wanted to, to devise a county planning document?

A Perhaps.

Q Okay. Now, doesn't that strike you as sort of the backwards way to go?

A No.

MR. SHENKER: Okay. Nothing else. Thank you, Mr. Cumin.

HEARINGS EXAMINER: Mr. Meloy:

Rebuttal, Cross, by Northern Cheyenne Tribe, Inc.

By Mr. Meloy:

Q Mr. Cumin, I'd like to refer you to page 2 of your statement, please. On line 16 you make reference in a sentence which concerns itself with the jurisdictional area of the Rosebud planning program. On line 16, you except the trust lands of the Northern Cheyenne Indian Reservation. Does the jurisdictional area of the Rosebud planning program include allotted lands on the Northern Cheyenne Reservation?

A If you're asking me as to my opinion, the jurisdiction of planning laws in Rosebud County extend to all fee-patent land on the Northern Cheyenne Reservation.

Q In other words, that's an opinion of yours? Do you know whether the jurisdictional area does relate pertaining to anything other than trust lands on the reservation? Do you know that, or is it just your opinion?

A The exclusion of trust land, you mean?

Q No, all lands with the exception of trust lands. In other words, Rosebud County Planning Board may plan and the county commissioners may zone for allotted lands on the Northern Cheyenne Reservation?

A Would you define allotted?

Q Well, what I'm getting at here is, when you said trust lands, did you mean to only refer to lands which are communally held by all of the members of the Cheyenne Reservation within the boundaries of the Cheyenne Reservation, or did you mean to exclude also other lands within the boundaries of the Cheyenne Reservation which may be owned by private landowners?

A Land held by private landowners I feel comes under the jurisdiction of local planning laws. Now, this is not necessarily the position of the Rosebud County Planning Board or the Rosebud County Commissioners.

Q Well, what is their position?

A I don't think they have one. I don't think they want to get into a lawsuit with the Northern Cheyenne Reservation as to who has planning jurisdiction on that land. The point of who has jurisdiction within the exterior confines of a federal reservation has not been defined in this state at this point, I don't believe.

Q Well, then let me ask a more specific question. Is the Rosebud County Planning Board, for whom you are assisting, preparing a comprehensive plan which will decide or determine the use of land on the Northern Cheyenne Reservation?

A I've never made a statement that we are preparing a comprehensive plan in Rosebud County.

Q Well, you made the statement you are assisting the Rosebud County Planning Board in the preparation of a comprehensive county planning program?

A Yes.

Q Okay. In your experience in assisting the Rosebud County Planning Board, do you know whether they are planning to plan on the Northern Cheyenne Reservation?

A Yes.

Q They are?

A Yes.

Q And only with regard to those lands which are not trust lands?

A Part of the planning tools that we are in the process of preparing or that have been prepared are of a specific item, such as a soil survey; this has been prepared for the reservation area as well as the off-reservation area, land ownership maps and patterns, topography and this type of thing, soil classifications and capability. This also extends into the lands of the Cheyenne Reservation.

Q That's an inventory of existing data, baseline data?

A Yes.

Q My question is, but you haven't gotten beyond that stage?

A In areas we've started. We have not started any specific post-inventory programs on the Northern Cheyenne Reservation at this time.

Q But you are planning to; is that correct?

A Yes.

Q On page 7 of your statement when you talk about the existence of coal tax funds available on a grant basis, on line 24 you talk about local governments in Rosebud County have applied for 5 million dollars in grant funds. Does that include the Northern Cheyenne Tribal Council as a local government in Rosebud County to whom those funds would be available?

A The question as to whether Indian tribes are units of local government in the state of Montana has been requested from the Montana attorney general and I don't think he has made a response to that point yet. At this point it is felt that they are not units of local government; they are a federal body.

Q How about the Lame Deer school district?

A I beg your pardon?

Q How about the Lame Deer school district? Is that a local government in Rosebud County?

A If it's a school district, yes.

Q Do you know whether they have applied for funds?

A I don't know specifically, no. The various school districts in the county, and there are 12 or so, quite a few anyway -- there's quite a few school districts. They have applied for over 7 million dollars in coal funds.

Q Would you be surprised to learn that the very first application was from the Lame Deer school district?

A No.

Q Would you be surprised to learn that that was turned down by the coal tax board?

A I didn't understand it was for the school district. I know Lame Deer applied for some planning funds and they were turned down -- or they were not turned down; I don't think a decision has been made yet on it.

MR. MELOY: I have no other questions, Mr. Davis.

HEARINGS EXAMINER: Mr. Graybill.

Rebuttal, Cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Cumin, you talk on page 2 of your statement about a profile of the construction worker. Have you constructed this profile?

A Yes.

Q And did you construct it of the Colstrip construction worker?

A Yes. I have to rephrase that answer. The Colstrip project was included as one of the projects in the survey of construction workers in the project.

Q In other words, you surveyed construction workers at Colstrip and at these other towns; is that right?

A Several other communities, yes.

Q Did you find that the construction worker profile showed that the Colstrip construction worker wanted to live at Colstrip?

A We didn't ask that question.

Q Well, where he wanted to live wasn't important to the profile?

A From a research basis, where he was living was more important than where he wanted to live to us. We didn't want opinions; we wanted facts.

Q Well, you'd agree with me that where a man wants to live is also a fact, isn't it?

A To him, I'm sure it is.

Q Yes. Where was he living at Colstrip?

A I don't have the specific data from that report.

Q Well, don't you know, though, that a lot of them didn't want to live at Colstrip?

A No, I don't.

Q Are all of the construction workers at the Colstrip plant living at Colstrip?

A I would assume they're not, no.

Q Was it significant to you as a planner how many of them weren't?

A At this point in time, no. If I were planning for them and if

I was hired by the county at the time that this construction work was coming in, yes. At this point, no.

Q Well, aren't you expecting more for 3 and 4?

A Yes.

Q But you don't think it's significant to find out where they might be living?

A Yes.

Q But you haven't done that?

A I don't think you can take where the construction workers live for 1 and 2 and automatically extrapolate to 3 and 4.

Q Why not? Are they going to be a different type of construction workers?

A I don't think there's a scientific base for that rationale. Just because one person does it doesn't mean the next person is going to do it.

Q Well, if that's the case you didn't need a study at all, did you?

A We didn't just study one project.

Q Well, but if your proposition is sound, that you can't tell what another person is going to do from what one says, then we can't tell what anybody is going to do from your study, can we?

A It would depend, I think, on the size of your sample.

Q You mean if you interviewed thousands and thousands of people this would somehow tell you better what the next person is going to do than if you interviewed ten or two or three?

A I think so, yes.

Q Well, did you take a large enough sample when you constructed your profile of the construction worker so that you'd be able to tell what's going to happen at Colstrip?

A Colstrip specifically, no.

Q So, as far as Colstrip is concerned, your study wasn't of much use because you can't predict from it, right?

A We can use it to help make predictions.

Q Well, but if you can't be sure of where the next person is going to live from what the last person said, how are you going to make predictions?

A On a one to one basis, I wouldn't want to make the judgement, but if I have enough of a sample I would feel more competent in my selection.

Q What did you find out from constructing this profile that was useful at Colstrip?

A I haven't used any of it at Colstrip yet; it's just in the form of being published. It was published in Washington; the first draft has just been passed out to the reviewing agency of which myself was not included. Once I get ahold of the document and can use it for planning specific purposes in the Rosebud area, I could answer that question more easily.

Q Is it going to tell you where the Colstrip workers are going to want to live?

A It's going to tell me on an average basis where construction workers will live, based upon the sample we took, distance from the project site, size of town, based upon the size of the construction worker's family, whether he is a bachelor, whether he is single, whether he lives someplace else, where he's from.

Q All right. Well now, haven't you already found out all of this information for Colstrip?

A No, I haven't personally. I did not say that I did the construction worker project myself; I took part in it. It was a tremendously large project.

Q Well, I'm just trying to find out what you mean when you write your statement. It says, "My work also included the preparation of --." And then skipping the first one, "such specialized research as part of the preparation of a profile of the construction worker." Now, you mean you didn't do it even though your statement says you did?

A I mean exactly what I said. I took part in part of it.

Q I see. And you don't know the results of it yet?

A No, I don't.

Q Do you know whether or not most of the construction workers -- do you know what part or what ratio of the construction workers lived at Colstrip for Colstrip 1 and 2?

A No, I don't.

Q As a planner, do you think that's significant?

A It will be, yes.

Q Do you think that information's been saved for you by someone else? In other words, how are you going to find it out? Colstrip 1 and 2 are practically finished?

A Well, for my preparatory planning work, as far as upcoming decisions that have to be made, where they lived at 1 and 2 is none of my immediate problem. Where they are going to live in 3 and 4 is.

Q How are you going to find that out? Are you going to wait and see?

A No, I'm in the process of trying to determine that right now, but I haven't done it to this point.

Q In other words, you've got a tough problem and you haven't been able to solve it?

A Well, we're solving it, yes.

Q All right.

A I'm in the middle of it.

Q All right. How are you going to find it out?

A The number of workers who will be residing in Colstrip?

Q Yes. Where are they going to live next time?

A By analyzing the past trends, by figuring out how many there are going to be, what the allocation of it is, taking some of the data out of the construction worker profile. Projections as to populations of communities is rather a complex study.

Q You aren't making it sound any easier by explaining it to me either. I agree with you. It's important and it's difficult. Now, I want to know how you're going to do it, Mr. Cumin? We know, for example, that there were 1400 full-time employees at Colstrip 1 and 2 at peak. We found that out the other day from a witness, 1390 or 1400, and that there's going to be 1700 or 1800 with Colstrip 3 and 4 at the peak. Now, how are you going to find out where they're going to live?

A By doing a rather intensive study of the projected number of employees, and I don't have an 1800 figure; I have one that's closer to 1500, projected employment that is generated by the primary employment, where they are going to live, the size of their families, available facilities and services in the various communities, analyzing a potential Indian employment, this type of thing.

Q Well, Mr. Cumin, I'm concerned immediately because you have a figure that differs from a figure that's been put in evidence here. Does that mean that some of the basic data you've collected may not be accurate?

A I have a figure, I think, of 1505 employees at peak employment for 3 and 4, and this was taken out of the Exhibit number 27 that was submitted here, I think, before this hearing.

Q Well, I'm not concerned with arguing about the exhibits. There was another one the other day that was higher than that, but let's assume you know there's 1504 going to be there, and you said something about knowing the size of their families. How does that help you know the size of their family?

A The data collected during the construction worker profile projects asked the question, "How big is your family?" And when we covered something like eight power plant construction projects, strip mine, and similar type of developments, we got something like 3000 responses; we have a general idea of what the average family size is.

Q All right. So, in other words, you're going to use this profile that you've participated in but haven't seen yet; that's how you're going to tell?

A Right.

Q But I understood you to say that that study did not determine where they lived at Colstrip 1 and 2; is that true?

A No, I didn't say that. You asked me if I knew where they wanted to live and thought that was pertinent. I said no. We did find out where the people that answered the survey lived.

Q All right. Are you familiar with the fact that the coal miners are living in a different part of Colstrip than the plant workers?

A No.

Q You aren't familiar with that fact that coal miners weren't allowed to live in certain parts and plant workers weren't allowed to live in other parts?

A No, I didn't know that.

Q Wouldn't that be significant in your planning?

A No. I don't see the applicability of it because I don't believe it. I haven't seen anything to justify that.

Q Well, don't you know that the -- do you know the large trailer court, the temporary trailer court?

A Yes.

Q Don't you know that mine workers can't live in that temporary trailer court?

A No, I didn't know that.

Q You didn't know that. As a planner, do you think it's a good idea to have -- well, let me ask you this. You would agree with me, would you not, that there are various levels of quality in the living accomodations of the workers at Colstrip for 1 and 2?

A Yes.

Q Can you tell me the justification for having a trailer court that looks like the big trailer court down there, the temporary trailer court? You don't consider that high-class planning, I trust?

A It's not an attractive trailer park, no.

Q It doesn't have any roadways; you can just drive anywhere; there's no curbs and grass and so forth, right?

A Right.

Q Do you know any justification for not letting the people in the temporary trailer court not grow gardens?

A No.

Q In your planning, have you made any attempts to modify that rule?

A Whether they can grow gardens or not, no.

Q Wouldn't that be a significant factor for getting a construction worker to have his family live with him instead of commute?

A Whether he can grow a garden or not?

Q Yes.

A It's not something that I can reach through planning.

Q Well, it's something you can stop or void through planning, isn't it? In other words, if you plan so that there's no place to have a garden, that sort of eliminates the problem, doesn't it?

A I am not familiar with any trailer parks anywhere, in Colstrip or anyplace else, that have private gardens. This involves ownership of land or some sort of a lease program for a plot site. I have never seen a trailer park with a garden in the back of it.

Q Do you have to own land to grow plants on it? Is that your testimony?

A I think that's the usual way it's done.

Q Well, it might be the overwhelming way, but, for example, I think you'd find in Russia and China they don't own the land and they grow a lot of stuff. In other words, you don't have to own it to grow a garden on it, do you? You just have to have permission; isn't that right?

A Yes.

Q Did you know that Western Energy Corporation had made it possible to have a swimming pool in Colstrip?

A No, I didn't.

Q Is there a swimming pool in Colstrip?

A Not to my recollection.

Q Did you know that they'd made it possible to have a bowling alley in Colstrip?

A No.

Q Is there a bowling alley in Colstrip?

A No.

Q Did you know they'd made it possible to have a movie theater in Colstrip?

A No.

Q Is there a movie theater in Colstrip?

A No.

Q Could it be sometimes, Mr. Cumin, that the best of plans don't get carried out?

A Seldom do plans get carried out. That's one of the fallacies of having any plan, and something that I'm trying to stay away from.

Q You're trying to stay away from not getting your plans carried out?

A A plan -- trying to end up with a plan.

Q How do you assure that your plans, if you make a good plan, get carried out?

A There's no way to assure it.

Q Is it important to have input from the local people?

A Very much so.

Q In order to get a plan carried out?

A Input from local people is very necessary to the planning process.

Q Now, what is the local governmental unit in Colstrip that has input to planning projects?

A There is no governmental unit, other than school districts in the Colstrip area. It is a company town.

Q And so to the extent that it's a company town, it's hard to get local people meaningfully involved in planning, isn't it?

A It's hard to get anybody involved in planning.

Q Well now, Mr. Cumin, don't be too discouraged. You are a planner, right?

A Yes.

Q And I want to ask you if it isn't true that where there is no local governmental unit, it is harder to get the local people involved in planning?

A Well, as there is no local governmental unit at Colstrip, it is considered a county jurisdictional area and we have representatives from the county jurisdictional area, including one specifically from Colstrip, on the Rosebud County Planning Board.

Q All right. Now, you've skipped to the particular from my general question. Isn't it, as a practical matter, always harder to get planning adopted or carried forward if there is not local representation?

A I don't have any experience in that area.

Q Well, I thought you told me just a few minutes ago that if you didn't have local participation it was hard to get the planning adopted or carried forward?

A Right.

Q Isn't that true as a general proposition?

A Right.

Q Now, how many local representatives of the Colstrip community are involved in planning for the Colstrip community?

A Planning specifically for the Colstrip community, there are no planning programs specifically for that community right now.

Q There are no programs for the Colstrip community right now?

A Specifically, right.

Q Well now, there's a county, you say, Rosebud County Planning Board; is that it?

A Yes.

Q How many representatives of the community of Colstrip sit on the Rosebud County Planning Board?

A One.

Q How many representatives of the Northern Cheyenne Tribe sit on the Rosebud County Planning Board?

A None.

Q Well, how many members are there on the Rosebud County Planning Board?

A Nine.

Q Does the person from Colstrip who sits on the board have any specific duties as to bringing the Colstrip problems to the attention of the Rosebud County Board? Is there a liaison function there?

A Yes.

Q And what is that function?

A Just as you've stated, it's a liaison function.

Q And when the person from the Rosebud County Planning Board who is from Colstrip goes back from the planning board to the community of Colstrip, to whom does he or she report?

A I don't know who he reports to.

Q Well, it wouldn't be too effective a liaison unless he had somebody to report to, would it?

A I imagine since Colstrip is a company community that he reports to a company official.

Q In other words, if he reports to the company official, then he in large part reflects and represents that company official's viewpoint on the Rosebud County Planning Board, doesn't he?

A I don't know. He's a representative of Colstrip.

Q Well, you mean he's a representative from Colstrip, don't you?

A Right.

Q What's his job? What's his basic occupation?

A I think he is city manager; I'm not sure.

Q A city manager?

A His role is that of a city manager for the community.

Q What's his name?

A Nolan Fandrick.

Q City manager for what city?

A His role is that of a city manager

Q For?

A The community area of Colstrip.

Q And by whom is he employed?

A Western Energy Company.

Q And who owns the property in Colstrip?

A Most of it is owned by Western Energy Company.

Q And who owns the buildings in which the businesses take place in Colstrip?

A Some of them are owned privately; some of them are owned by Western Energy Company, to my best of knowledge.

Q There has been testimony here that none of the buildings in the town of Colstrip in which businesses are carried out are owned privately. Do you have other information?

A No, I don't.

Q And what's the principal industry in Colstrip that this city manager would be acquainted with?

A I imagine the extraction of coal and the generation of power.

Q And so whose viewpoint do you expect that he would represent on the Rosebud County Planning Board?

A The company community of Colstrip.

Q All right. Now, what I'm asking you is -- to get back to my first question -- what mechanism is there for getting the common people or the noncompany people, the employees' viewpoint represented in the planning process at Colstrip?

A They are welcome to come to all of the meetings. They are public meetings; we welcome public input. That would probably be the extent.

Q How long has this city manager been in Colstrip?

A I don't know.

Q Well, as a matter of fact, don't you know that he's a new employee?

A No, I don't. He's been there longer than I have.

Q How long have you been there?

A Since November 1st of 1975.

Q Is that when you first addressed yourself to the Colstrip case for the Colstrip situation?

A I didn't address myself specifically to the Colstrip situation. I work for the Rosebud County Planning Board.

Q Is that when you first addressed yourself to Rosebud's problems?

A Yes.

Q So the viewpoints and the ideas that you've expressed in your statements, you have become acquainted with since November 1st, 1975?

A You'd have to make that more specific.

Q Well, in other words, you didn't know anything or care anything about Rosebud planning before November 1st, 1975. That's when you started on this job?

A It's not that simple, no. I was familiar with the Ken R. White plan in Colstrip vaguely when it was first done several years ago. I'm familiar with energy-impact counties. I'm also planning advisor to Big Horn County to the west, counties to the east, counties to the north.

Q Have you -- you say you're familiar with energy producing counties. Are you familiar with those in Northern Wyoming?

A No.

Q Have you been to Gillette?

A Yes.

Q Do you think that's an example of good planning?

A No.

Q It's an energy-producing county isn't it?

A Yes.

Q It's a coal-producing county isn't it?

A I think so, yes.

Q Is it a company town?

A Not to my knowledge.

Q How many meetings have you had concerning planning at Colstrip with the population of Colstrip since November 1st, 1975?

A I haven't had any meetings specifically with the Colstrip people, just like I haven't had any meetings with the Lame Deer people specifically, or the Ashland people specifically, or the Rosebud people specifically.

Q Well, do you think that the problems at Colstrip are homogeneous with those of the rest of Rosebud County?

A Yes.

Q Do you think they're all the same?

A Yes. They are intensified in Colstrip, but there has been much more planning activity occurring in Colstrip, too.

Q Well, a minute ago you said that the way you got input from the local people in the planning projects was through meetings. That's the only reason I remember; if there's another I'd like to be reminded of it?

A I stated that the Rosebud County Planning Board meetings are open to the public and the public are welcomed.

Q Oh. So it's the Rosebud County Planning Board meetings that are supposed to be the vehicle through which the people of Colstrip make known their needs?

A I think that would be an appropriate way to do it, yes.

Q Has it been your historical experience in the planning field that populations of towns and cities that have planning boards use the planning board meeting as the principal method for getting material before the planning board, for getting ideas and problems before the planning board?

A It's one of the principal ways, yes.

Q Well, as a matter of fact, Mr. Cumin, isn't the principal way through the governmental units and through the private industries and individuals who have private projects? Aren't those the two principal methods through which a matter comes before planning boards?

A No.

Q That's not so?

A No.

Q When was the last time there was a public group appeared before the planning board in Billings and tried to have anything done; do you recall that?

A Yes. They do that about three times a month.

Q They do?

A Yes.

Q Well then, they ought to be doing that from Colstrip hadn't they?

A Yes.

Q Do you have any recollection of anybody from Colstrip coming and putting evidence before the planning board of Rosebud County?

A Not, as you say, the more common inhabitants of Colstrip other than people from Western Energy, no.

Q Just the company?

A Yes, or representatives of the company.

Q So whatever the reason, we aren't getting input from the people at Colstrip, just from the company?

A For whatever the reason, right.

Q As a planner, do you favor company towns?

A I haven't made a decision on it.

Q Are you familiar with the fact that the Montana Power Company has assigned somebody with the primary duties of planning the community of Colstrip?

A I'm aware of the fact that Montana Power Company has hired or has reallocated Jim Murphy whose job, as I understand it, is to plan the transition of Colstrip as a company owned town to that of one publicly held by its citizens.

Q How many houses in Colstrip have been sold by the Western Energy Company to the public or to the people that live there, to your knowledge?

A They have just finished their appraisal process of the houses in Colstrip. They have probably sold three.

Q Did they sell them on time or for a fixed price? That is, are they sold on a contract for deed or are they paid off?

A I don't know. They've sold some land in the community to a private developer who has built houses and then sold the houses, however, how he's financed them, I don't know.

Q There's only one of those type of developers isn't there?

A Pardon me?

Q There's only one person that's doing that; isn't that right?

A What was your question again?

Q There's only one person who has built any houses in Colstrip on development, isn't that right?

A I'm only familiar with an outfit called Delta Group.

Q Right. Would it be fair to say that over 95 percent of the houses in Colstrip are still owned by Western Energy Company?

A Yes.

Q What effect does that have on your planning?

A The fact that Colstrip is a company owned town is probably one of the reasons that Colstrip is not a real mess right now because the company has maintained a planning program, a rather intensive planning and development program for Colstrip over the last few years which just recently terminated. So the effect of having a company owned town there has been very good in my viewpoint.

Q In what sense has it been good? Has it allowed the people to own their own homes?

A No.

Q Has it allowed the people to construct their own recreational facilities?

A Not altogether.

Q Has it allowed the people to set up any form of private business that they want to?

A I don't know. Most of the people living there work for the power plant or for the mine.

Q How many private businesses are there in Colstrip?

A I don't know a specific number.

Q How does six sound?

A Probable.

Q And there were 1400 full-time employees at the Colstrip 1 and 2 plant. I don't know the population of Colstrip; maybe you'd have some idea. Isn't it somewhere over 2000?

A 2362.

Q Now, in your experience as a planner, can you name me any other town in Montana of 2000 people and over that hasn't got more than six businesses?

A I'm not familiar with any other company towns in Montana.

Q Oh, no, I'm not talking about company towns, sir. Can you name me any town in Montana with 2000 inhabitants that doesn't have over six businesses?

A No, I can't.

Q Having a number of businesses gives a citizen a choice of services, doesn't it?

A Yes.

Q Would you agree with me that the choice of services is somewhat limited in Colstrip?

A Yes.

Q Would you agree with me that the choice of recreation is somewhat limited in Colstrip?

A At this time, yes.

Q As a planner, you would agree that a choice of services is a desirable characteristic for a town, isn't it?

A Yes.

Q I see in your paper on page 3 that someone, it looks like the federal government, is about to give a half a million dollars to Colstrip; is that right, for a park?

A Yes.

Q Who pays for the parks in the other small towns in Montana?

A I don't know who's paid for the parks as they exist in the past. The new parks that come into towns and the new developments that are built on existing parks are paid for by new developers.

Q By whom?

A By new developers or by developments.

Q The money that the Federal Bureau of Outdoor Recreation is going to spend at Colstrip, is that tax money from the general population?

A I don't know the exact source of the Bureau of Recreation funds. It's the Bureau of Outdoor Recreation.

Q You don't know the source of their funds?

A I imagine they are tax dollars, but I don't know specifically.

Q Now, you talk about some zoning being proposed as an interim measure in the Colstrip area, is that right, to slow non-subdivision type developments? I'm on page 6. Is that zoning you're talking about at the intersection of the interstate highway and the road to Colstrip?

A The area has not been defined. At present we are considering the area south of the Yellowstone River and generally north of the Cheyenne Indian Reservation which would include the Colstrip area and the interchange and the connecting road.

Q And you're proposing a zoning for that area?

A No. What was originally proposed down there was zoning for one mile on either side of the centerline of the right-of-way of the Colstrip to interstate 94 road and the interstate 94 road to the city of Forsyth. This was an original proposal that was just discussed by the planning board. Now, that proposal has been changed once; it's in the process of still being changed. We are trying to get away from the use of the word zoning because it is not zoning in the classical sense. What it is is development standards based upon environmental controls.

Q Who proposed it?

A I did.

Q Do you live in the area in which the zoning would apply?

A No, I don't.

Q Do other people own private property in that area?

A Yes.

Q Is the reason for the proposal because of the Colstrip development?

A No, the reason for the proposal is the potential for bad land use in that area.

Q Well, there's a potential for bad land use just three miles east of the capitol here, isn't there?

A There's more than a potential there, I think.

Q What I'm getting at is, why did you propose it for this particular place? Was it because of the Colstrip project? Well, let me ask an easier question. Would you have made that proposal if there hadn't been a Colstrip project?

A I wouldn't have made the proposal if it hadn't been for the coal development potential in that particular area.

Q Okay. So what's happening then is that -- and there are people that own private land in this area that you're proposing to plan?

A Yes.

Q What's happening is that because the Montana Power and the Western Energy Company are building big plants in Colstrip you have proposed a series of restrictions on the private property owned by other people along the highway; is that a fair statement?

A No.

Q It's not a fair statement?

A No.

Q In what sense is it false?

A I have not got any parameters as to the use of land along the highway. It was not limited to the highway. I stated earlier that that was an original proposal that was discussed briefly by the planning board. The development controls and environmental standards apply to the new use of land by anyone including Western Energy, and specifically, perhaps, Western Energy.

Q But the point that I'm trying to make, isn't it true, Mr. Cumin, that as a result of the fact that there's a large project in that county at Colstrip, people who own private property are now being faced with the prospect of planning which will restrict their use of their own private property?

A I don't know if it's a direct result of the project or not. Planning does restrict unlimited use of private property, yes.

Q And were any of the people who live in the area to be planned represented on the group that proposed the planning?

A Yes.

Q Did you take a vote of those people to find out if they wanted planning?

A The vote of which people?

Q The people in the area that you intend to plan? I'm not using the word zoning purposely.

A Right. The provision for those people who live in the jurisdictional area of the proposed planning is built into the review process of the proposed plan, yes.

Q They have to approve it before it will be put into effect?

A They have to disprove it.

Q They'll have an opportunity to avoid it; is that it?

A Yes.

Q How long has the county been working on that measure?

A Working on these development standards?

Q Yes.

A For about two months.

Q Is there an interim zoning measure currently in effect along highway 315?

A No.

Q Do you think that the construction of a trailer court on a permanent flood plain is an example of sound planning?

A No.

Q Did you know that one of the trailer courts at Colstrip is built on a flood plain?

MR. BELLINGHAM: We object on the grounds that it assumes facts that are not in evidence.

HEARINGS EXAMINER: Overruled. He's answered already, I guess.

Q What was your answer?

A Would you repeat the question?

Q Did you know that one of the trailer courts at Colstrip was built on a flood plain?

MR. BELLINGHAM: We reiterate our objection that it assumes facts that are not in evidence. The evidence is strictly a very small portion of a trailer camp that may be in a so-called flood zone, but certainly not the entire trailer court as Mr. Graybill would insinuate.

MR. GRAYBILL: Well, I'll amend the question.

Q Do you think it's good planning to have any part of a trailer court built on a flood plain?

A No.

Q Did you know that part of a trailer court in Colstrip was built on a flood plain?

A No, I did not, and I still don't.

Q Well, it's something you might look into when you get --

A I'm aware of the situation to which you refer. It happened before my tenure with the Rosebud County Planning Board and I have not heard it defined or seen a flood plain delineation study in the area, and a comment that was made that perhaps there was part of the trailer park in a flood plain, a company officer indicated that that was taken out of the flood plain by raising the level of the land in the trailer court. Now, that's as far as I know anything about that.

Q Are you familiar with where the main highway into Colstrip from the highway is located now?

A Yes.

Q Do you think it's located in a proper manner?

A No.

Q Why not?

A Because by its use it's an intensified transportation route and it goes -- the road goes right by the school and right by the city park, but this is not the road that is planned as the main entrance for Colstrip. It is merely one, like you said, that is being presently used.

Q Are you familiar with the BLM South Rosebud planning unit?

A Yes.

Q Why didn't you mention it in your statement? Don't you think it's significant?

A Yes.

Q What attention is being paid to its proposals?

A None at the local level at this time. We just got a copy of that less than a month ago. I've glanced through it briefly. The only thing I noted of particular interest was that the South Rosebud planning unit is the same area that was proposed more or less for the proposed development standards.

Q All right. I have only one other area I wanted to ask you about. On attachment page 1 of your statement, under "Natural Resource Inventory," you say "Water Quality and Quantity." What's been done to study the water quality of Armell's Creek in Rosebud County?

A The water quality planning program in Rosebud County as administered through the Tongue-Yellowstone planning organization, and I am not specifically familiar with activities in Armell's Creek, if any.

Q What's been done with reference to quantifying the amount of water necessary for irrigation in Rosebud County?

A I am not familiar with that.

Q Well, you'd agree with me that these are very important elements, wouldn't you, in planning for Rosebud County?

A Yes.

Q But to your knowledge, you don't know what's been done there?

A No, I just know that a planning program for water quality and quantity in Rosebud County is currently underway.

Q Don't you think that we'd better wait until we find the results of that study before we build two big power plants that might affect those two elements, or do you think we should build the power plants before we know what the water quality and quantity is?

A Not being a water quality engineer, I can't answer that question.

Q Well, as a planner, is it usually your practice to build plants before you know what the natural resources are, in your natural resource inventory?

A As a planner, I don't build plants.

Q As a planner, do you support the building of plants before you know what the natural resources in your natural resource inventory are?

A No.

Q So I take it that you can agree with me that we'd better find out what the water quality and quantity are before we build 3 and 4, wouldn't you?

A I would think that the issue of water quality and quantity as it pertains to Colstrip 3 and 4 has been discussed by people more knowledgeable in that field than myself, and I'd rather pass on that question.

Q Well, it has been discussed, and as a matter of fact the water quality expert for the state of Montana, Mr. Botz, has testified that there has been no test on the water quality of Armell's Creek, no extensive analysis of Armell's Creek, and I'm asking if you don't think that should be done before we build these plants?

A The water sampling on Armell's Creek can be done very quickly.

Q Well, Mr. Botz didn't think so, but maybe you have some reason to believe differently. What is the basis of your statement?

A It does not take long to get a water sample from Armell's Creek tested, if that is what you're looking for, the water quality.

Q You see, the problem, Mr. Cumin, is that you can't test one of these streams one day. You've got to test them by at least a year and maybe by more than a year because there are different cycles of a stream. So one of the points that's been made here is that there hasn't been an adequate water quality test on that stream and that it would take some time to do it. Now, my question to you is that knowing that fact or assuming that fact, wouldn't you think it would be a good idea to do that before we built two more big power plants on the stream?

A Yes.

Q And let's talk about air quality. Are you an authority in that field?

A No, I'm not.

Q Well, thank goodness. But, Mr. Cumin, if you were going to build two large power plants in the middle of Rosebud County at Colstrip and operate them, wouldn't you like to see what effect they have on air quality before you built two more, as a planner?

A   Yes.

MR. GRAYBILL: Thank you. That's all.

HEARINGS EXAMINER: Mr. Bellingham.

MR. BELLINGHAM: May I have a a couple of minutes, sir?

HEARINGS EXAMINER: Yes, you sure can.

(BRIEF RECESS AT 2:38 P.M.)

Following a brief recess, the hearing reconvened at 2:45 P.M. on March 29, 1976.

CONTINUATION OF EXAMINATION OF CAL CUMIN

Rebuttal, Redirect, by Applicants

By Mr. Bellingham:

Q   I have a few questions here, Mr. Cumin. I think you indicated that no comprehensive county plan had been adopted as yet, and that you weren't sure of whether or not there would be one; is that right?

A   That's correct.

Q   Why did you answer in that fashion?

A   Because the adoption of a comprehensive plan is strictly up to the people and the politicians, the decision makers in the county, and I can't sit here and predict whether they will or will not adopt a comprehensive plan.

Q Well, basically that's up to the Rosebud County Planning Board; isn't that right?

A Partially, yes. They should make a decision as to recommendation of the adoption.

Q And what is your function insofar as that so-called comprehensive county plan?

A I'm an advisor to the Rosebud County Planning Board.

Q But you are preparing tools for them to work with; is that correct?

A This is correct.

Q Now, you were asked whether or not this was a backward way of doing it; do you recall that?

A Yes.

Q And your answer was no. Why did you answer that no?

A Because as was pointed out earlier in my testimony, there is no hard and fast definition of what a comprehensive plan is in this state, and I tried to approach the planning related problems in my jurisdiction from the point of providing an advisory service to the decision makers, not by providing them a comprehensive plan. You can provide them the knowledge of what will happen if they have uncontrolled development; you can provide the inventory data; you can provide transportation studies; you can provide projections of the population and economic bases, and you can wrap it all up and call it a comprehensive plan if you like or you can use the individual tools as they are most useful to the local decision makers, and at that point, that is what is being done; I'm providing them or advising them on what they can do within the planning parameters in Montana and the locality.

Q Well, you were asked about certain things down there such as a swimming pool and somebody mentioned facetiously about a barbershop; you weren't asked that. Is there a barbershop there?

A Yes, there is.

Q You were asked general questions relative to the town of Colstrip. Have you worked with people from Western Energy?

A Yes.

Q Who have you worked with?

A I've worked with Nolan Fandrick, the representative on the planning board, and Martin White who, I believe, is the project director for the area.

Q Have they cooperated with you in every way?

A Yes.

Q Now, you mentioned Fandrick; you didn't know how long he'd been there, you thought perhaps rather new. Are you aware of the fact that he's lived in Colstrip since 1959?

A No, I'm not.

Q Now, you were asked questions relative to water testing, air quality and so forth down in that area. Do you have anything to do with those functions as a planner?

A No, I don't.

Q Is that outside your responsibility?

A Yes.

Q And do you need to know these details in order to go ahead with the planning duties and responsibilities that have been placed in your hands?

A No.

Q Now, it's my understanding that as yet there has not been anything specific done as far as the planning and as far as the town of Colstrip, town of Ashland, Forsyth, Rosebud and Lame Deer; is that correct?

A There are pieces of planning -- the program of planning in the county is relatively new and rather than going to one community and intensively planning it and moving on, we are trying to do broad-based planning as the problems arise. There has been intensive planning in the company town of Colstrip. The town was previously planned by a consulting firm as a company town. It was planned on the basis of that original plan by a consortium of architects, engineers and planners. The town of Ashland has just had a water and sewer planning study financed and put together for it. The town of Rosebud is currently doing a sewer planning study and they have just obtained $200,000.00 from the Housing and Urban Development Committee, the development act program for updating their water system. We have been gathering land use and land ownership sewer capability, this type of data for the city of Forsyth, and we have other programs such as the BLM study that was mentioned for the midcounty area, countywide soil surveys, classifications of soil capabilities, transportation system updating, and we are currently in the process of projecting the population and economic bases for the counties, for the county of Rosebud and its incorporated and unincorporated areas. We are putting together, as was mentioned, a countywide development standard based upon environmental controls. We have the 208 water quality study ongoing, which was previously mentioned, which involves a countywide inventory and an analysis of land uses as they affect water quality and the quality of water in the county area. We have the potential of the state Montana Economic Land Development Act for planning the county area. We have not initiated anything specifically under that, but it is on the statute books. We have the Montana Subdivision Platting Act, as I mentioned in my testimony, which is probably one of the most powerful subdivision regulations in the Western United States. We have a complete environmental impact assessment process which is utilized in county planning programs.

Q Well, as far as these towns are concerned, or cities that I've mentioned, there has been some planning so far that has evolved around these particular towns; is that right?

A Yes. I'm not familiar specifically with a planning program in the community of Lame Deer, but I know there is intensive housing activity in the community, but other than that, I'm not sure.

Q And as far as your future activities are concerned, are you going to be doing the work individually as far as these particular towns are concerned?

A Yes. Basically what that boils down to -- before you can plan where a community is going to grow, you're going to have to determine how much the community is going to grow, and that is why we are currently in the process of preparing a population and economic projection for the county and its communities. Once we have this, based upon land capabilities and restraints and appropriate land uses, we can attempt to determine and graphically display where communities should grow, and we can make this recommendation to the governments involved, control it through the environmental impact assessment requirements through a comprehensive plan, if we reach that stage, through the House Bill 666 amendment to the Montana Subdivision and Platting Act which requires a justification of need for a subdivision.

Q Well now, let's go to the planning budgets. Are you familiar with Rosebud County planning budgets over the last couple of years?

A Yes.

Q Well, what about the '74-'75 fiscal year; was there such a planning budget in Rosebud County?

A Yes. It was something like $26,500.

Q And what about '75-'76?

A The current budget was, I think, $24,100 for planning and they've already programmed to spend more than that with the assistance of some federal and local grants that they have obtained.

Q Now, I think you indicated what the present population of Colstrip was, 2362; am I correct in that?

A Yes.

Q What date was that?

A February, 1976.

Q What about the population of Forsyth; do you have a figure on that?

A 2465.

Q And what about total people in Rosebud County as of that date?

A 9578.

Q And those figures are also as of February of '76?

A Yes.

Q Do you know what the total population was in Rosebud County as of 1970?

A Yes, it was 6032.

Q And what about Forsyth as of '70?

A 1873.

Q And Colstrip?

A It was approximately 200.

Q What is the biggest impact caused by generating units such as 1 and 2 on the community?

A I would think it would be the transient construction workers.

Q Fine. Now, can the population impact of Colstrip units 3 and 4, if they are constructed, be handled adequately from a planning standpoint?

A Yes.

Q Why do you say that?

A The biggest problem, as many people point out, in the city of Forsyth, or the community area of Colstrip, is the large trailer park which has a lot of junk accumulated in it and is not what you would call, perhaps, a nice trailer park. As I understand it, this trailer park is going to have to be moved very soon. It is the trailer park which houses the transient construction workers and the bachelor construction personnel who desire to live there. When they get ready to move this, which they will probably do as I understand it before 3 and 4 are constructed, if they are constructed, they must go through the complete processes of the Montana Subdivision and Platting Act as delineated in the local Rosebud County subdivision regulations. This requires a complete environmental impact review of the proposed subdivision as to groundwater, subsurface geology, population impact on schools, traffic generation, relationship to other housing units, definition of a public need for it, public opinion review and so forth. These requirements are brought before the Rosebud County Planning Board, both graphically and in textual form. They are held -- public hearings are held on them, and no construction or land improvement activity can occur in the construction of a new trailer park until they have received approval of their preliminary design, concept and of their environmental impact assessment.

Q Well, have there been any steps taken down in Rosebud County that leads you to that conclusion also within the last six months or a year?

A In anticipation of such a very large project, we have revamped the subdivision ordinance; we have tightened down the environmental controls; we have also included all of the updated legislation, such as House Bill 666 again into the subdivision regulations.

Q Now, has there been steps taken to hire any people down in that area that are involved in the planning?

A Currently they have a full-time planning coordinator who, as has been pointed out in previous testimony, is formerly an agricultural extension agent. He has excellent rapport with Rosebud County population, which is basically an agricultural county, or was basically an agricultural county. He is going to be acquiring a full-time secretary; they have hired my firm as planning advisors; they've also made arrangements and have hired a county sanitarian. They are considering such proposals as a septic tank permit through their health department, and this type of thing.

Q Now, I think you mentioned in your statement the coal fund taxes?

A Yes.

Q And is that another tool that can be used by the local planners?

A It's an excellent tool. As I stated earlier in my testimony the school districts in Rosebud County have applied for over 7 million dollars in coal tax funds, and they have been given approval by the planning board of their preapplications and given the green light to go ahead with their final applications. In addition, the community of Colstrip has applied for something like $300,000.00 to improve their sewage plant, to expand it. The city of Forsyth has applied for -- and they have also been given approval to go ahead with their final application. The city of Forsyth has applied for -- in addition to its schools it has applied for funds to improve its water and sewer system to the tune of, I think, about $170,000.00. They've also applied for $36,000.00 in continuing planning funds and they have been given the green light to go ahead with the final application on both of those projects. In addition to that, the act which set up the coal board set aside something like 6.5 million dollars for area impacted highways; mainly the one that has been discussed before this board has been the road from Colstrip to interstate 94. This construction should start on the improvements to this road in the spring of this year.

Q Do you feel that there is control of development down in Rosebud County?

A Yes.

Q And the reasons for that are what?

A Basically the type of control we have is over the large subdivisions, and that is through the Montana Subdivision and Platting Act and the local county subdivision regulations. We are presently, as has been brought out before, trying to formulate a zoning type of development ordinance that will concentrate upon the specific isolated developments, such as a restaurant or a bar facility off by itself someplace; it does not involve a division of land as defined under state law. And the combination of the Subdivision Development Act and its inherent environmental review process plus a development control ordinance would give us a good handle on development in the county.

Q Do you feel there is sufficient time left to adequately plan for units 3 and 4 in the event that they are constructed?

A Yes.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Mr. Shenker.

Rebuttal, Re-cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Well, obviously implicit in your last answer then, Mr. Cumin, is the fact that the planning hasn't been done yet, and we'd all agree that that's true, isn't it?

A Yes.

Q And, therefore, -- let me just back up on that a little bit further, Mr. Cumin. It would be pretty hard, wouldn't it, to do some planning to determine, for example, what you consider to be the most impactible development, namely transient construction workers, when there isn't even a contract let for the construction of Colstrip 3 and 4; you know that, don't you?

A Yes.

Q Now, in terms of the coal tax monies, did I understand you to say that you understood that there would be monies provided for highway impact?

A Yes.

Q Well, can you tell me, sir, why the city of Forsyth in its application 0013 before the coal tax board for its impact upon Oak Street was turned down by the coal tax board?

A They apparently did not figure that the city street of Oak Street was considered an area highway, and I do not know what its limitation was to, but it was, I think, to primary and secondary roadways.

Q Well, of course, Oak Street is now being used as a primary highway during the closure of the other main highway before further construction is completed; isn't that true?

A I don't know.

Q What the coal tax board actually said on the Forsyth application was, "Go see the highway department," right?

A I don't know what they said exactly.

Q Okay. Now, if I heard you correctly in answer to Mr. Bellingham's question on whether you can predict if a comprehensive planning document will be adopted, I believe it would be your testimony, then, would it not, Mr. Cumin, that the board of county commissioners of Rosebud County have the decision making power either to adopt or not to adopt some comprehensive document; isn't that true?

A Yes.

Q Well, they're not going to adopt something that isn't proposed to them, are they?

A No.

Q That's what the planning board is for, right?

A It can be used for that, yes.

Q And if, therefore, I wanted to know whether the plans, such as they may be for Colstrip 3 and 4, were consistent with any regional comprehensive planning done in Rosebud County, I couldn't know that today, could I?

A No.

Q Have you heard of something called the Gillette syndrome?

A Yes.

Q What is that, Mr. Cumin?

A I've merely heard of it; I can't define it.

Q That's been described by Dr. Eldon Coors in his study of Gillette, Wyoming; isn't that right?

A Yes.

Q And that was the finding that in the development of Gillette, Wyoming there was an alarming increase in suicide attempts, alcoholism, depression and other social breakdowns in that community; that's what is called Gillette syndrome, right?

A If you say so.

Q You don't disagree with that, do you?

A No.

Q And in Gillette, of course, as far as school impact is concerned, the opinion of the folks down there looking at planning implications is that it's going to have a devastating effect upon an educational system; isn't that true?

A I don't know.

Q You told Mr. Bellingham that you had worked with Mr. Martin White whom you described as the project director for the area. He is in fact the project director for the Western Energy Company in the development of Colstrip; isn't that right?

A Yes, either that or what they call the project manager, or the project director. I'm not sure which it is.

Q A full-time employee of the Western Energy Company?

A Yes.

Q Did I also understand you to say the Western Energy Company now has terminated the planning programs that have been underway under Mr. White's direction in connection with Colstrip 1 and 2?

A I don't know if they've terminated them or not. They've more or less finished up two phases of it and have not proceeded further.

Q Mr. Bellingham inquired of you whether you had to know about air and water quality problems, for example, in order for you to do your job; that is to say, I suppose, your specific assignment. Of course, not having been assigned that area, that's not within your particular can; is that right?

A Which area is that?

Q Air and water quality.

A It's not my particular keg, right.

Q Right. However, I do understand your testimony correctly, do I not, Mr. Cumin, that before one should embark upon a project, like Colstrip 3 and 4, one would certainly want to know the answers to all of the information which you set forth in your attachment 1 to your testimony, which would be the inventory, the demographic information, the evaluations of the most likely scenarios and whatever necessary refinement should be made, the community service and facility planning tasks, and the overall county development strategy. That's why you do that work, isn't it?

A Yes.

Q And I suppose the record is reasonably clear, but we ought to have your answer on it, Mr. Cumin. The material that you set forth in attachment number 1 is what you want to see done, not something that has been done already; isn't that correct?

A It's a general guideline for approaching the planning process in Rosebud County. Some of it has been done; some of it is being done; some of it still has to be done. I would think that a specific item such as air and water quality would be an end result, hopefully, of this major facilities' siting act which would generate that specific kind of information beyond the scope of a local planning program.

Q As you look at the general guideline, as you describe it, which is your attachment number 1, it is correct to say, is it not, that the entirety of that guideline has not been completed?

A This is true.

MR. SHENKER: Thank you very much, Mr. Cumin. Nothing further.

HEARINGS EXAMINER: Mr. Meloy.

MR. MELOY: No questions.

HEARINGS EXAMINER: Mr. Graybill.

Rebuttal, Re-cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Cumin, did I understand you to say that Colstrip had something over 2000 present inhabitants?

A Yes.

Q And Forsyth 2300 and some?

A Yes. Forsyth has 2465 people as of February, 1976.

Q And how many did Colstrip have?

A 2362.

Q 2362?

A Yes.

Q Just a hundred less?

A Approximately.

Q In other words, Forsyth and Colstrip are about the same size right now?

A They have the same number of people almost, yes.

Q When Colstrip 3 and 4 are built, if they are, do you anticipate, as a planner, that the population of Colstrip would be greater than Forsyth's?

A I imagine it will be while the construction workers are there, yes.

Q As a planner, you'd recognize considerable difference in the business community of Forsyth and Colstrip, wouldn't you?

A Yes.

Q How many members of the planning board are from Forsyth?

A I'm not specifically sure, but I think there are four.

Q Four from Forsyth?

A Yes.

Q One from Colstrip?

A Yes.

Q The other four are from rural areas?

A Yes.

Q Are any of the other four from the Cheyenne Reservation?

A Within the exterior confines of the reservation, I don't think so, no.

Q Can you tell me of any other members of the planning board that are from the area around Colstrip and south in the county?

A The chairman of the planning board is from an area directly southeast from Birney.

Q Birney?

A Directly south of the reservation.

Q So we have the Birney man and the Colstrip man representing the south end of the county?

A At that extreme, yes.

Q And it's the planning board that's hired this planning coordinator, or the county of Rosebud?

A The planning board.

Q The planning board has hired a planning coordinator; is that right?

A I don't know who hired the planning coordinator. I think he's hired by the county.

Q And is he the executive officer of the planning board?

A Planning boards don't usually have executive officers. They have a chairman and he is not the chairman. He is what they term in this state a planning coordinator, which is usually a person who is not a professional planner, but whose job it is to monitor planning activities with the assistance of state and local consultants such as myself.

Q Well, I understand they hired you on a consultancy basis. Do they have other staff besides the planning coordinator?

A They have a secretary and they have a sanitarian who is planning related.

Q A sanitarian and a secretary. They don't have any draftsmen?

A No.

Q So in effect, the planning coordinator and the sanitarian are the staff, and the secretary is their staff, right?

A Right. The secretary works for the planning coordinator and for the planning board.

MR. GRAYBILL: That is all.

HEARINGS EXAMINER: Mr. Bellingham.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Very well, sir, you're excused.

(WITNESS EXCUSED)

HEARINGS EXAMINER: Next witness.

MR. ROSS: The applicants call Mr. John C. Brown.

JOHN C. BROWN, called as a rebuttal witness by the Applicants, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. ROSS: There are no exhibits with Mr. Brown's testimony and there are no corrections.

(THE WRITTEN DIRECT TESTIMONY OF MR. JOHN C. BROWN WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATEMENT OF TESTIMONY OF JOHN C. BROWN

My name is John C. Brown. I own and operate a cow-calf operation near Worden, Montana. I started this operation in 1948 by leasing a small ranch, which I later purchased. I have purchased additional lands until I now run about 400 cow-calf pairs in normal years.

I came here today to express my opinions concerning Colstrip Plants 3 and 4 and the transmission lines needed to transport this power.

I know that our consumption of electricity at the ranch is steadily increasing. This is also true of all of the neighbors I have talked to. Also our population is constantly increasing. It, therefore, follows that we must be constantly increasing our production of electricity if we are to keep our present standard of living.

Every property owner in Yellowstone County should be thankful that the transmission line from Colstrip Plants 1 and 2 passes through our area. Each mile of this line adds about $3,200.00 to the tax revenue of the County it is in, while adding very little, if any, to the demand for services. This will add about $55,000.00 per year in taxes to my local school district and about $190,000.00 per year to the taxes of Yellowstone County using 1975 mill levies. This does not include the taxes generated by the sub-station at Broadview. I know of no other source whereby we can raise so much taxes while adding so little in demand for services.

It is often said that the large corporations run roughshod over the small operators. This has certainly not been the case with Montana Power in its dealings with me and my neighboring ranchers. I had a piece of road about 5 miles from the power line that was nearly impassable and could be fixed only with heavy equipment. The contractor building the line most graciously, and at no cost to me, hauled a D-8 cat, dozer and ripper to the site and knocked down a rimrock and greatly improved the road for me.

The gates that Montana Power put in on fences where the power line crossed them were furnished with chains and padlocks. To begin with I didn't keep these gates locked but last winter coyote hunters started driving down the power line right of way without permission leaving the gates open. I called the company about it one afternoon and the next morning they sent a man out with a key for each of our three pickups so that we could conveniently keep them locked. I mention these things to show how considerate Montana Power and their construction company have been in their dealings with me.

The power line crosses 4 miles of my ranch and I dreaded the destruction to be caused by bulldozing the road on the right of way. I have been very pleased to note that the sod has not been disturbed except where the land is too steep or sideling for their equipment to negotiate. The sod in the more level areas is hard packed but will quickly resod after the line is completed. Of course, some sod was destroyed but from my past experience with the company, I am sure that I will be reasonably reimbursed for these damages.

I understand that part of the electricity produced by Colstrip Plants 3 and 4 will be exported to neighboring states. I see nothing wrong with this since we must import from other states many of the necessities and luxuries that we have become accustomed to and would hate to have to do without.

In finishing, let me say that I do not like the power line crossing my ranch. If it had to be built, it is too bad that it is not possible, or at least economically feasible, to put it underground where it would not be visible. The sight of the line certainly degrades the aesthetic value of the wide open spaces, but when I add all of the pros and cons I will have to recommend that Colstrip 3 and 4 and the necessary power lines to transport this power be built.

EXAMINATION OF JOHN C. BROWN

Rebuttal, Cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Mr. Brown, we heard from Mr. Kemph last week, sir. I see he's back here today with you, along with Mr. Heston. Did you folks all fly in today?

A Yes, we did.

Q On the company plane?

A Yes, we did.

Q As I read your statement, Mr. Brown, you think that the folks from the Montana Power Company have been gracious and considerate. Is that your view, sir?

A They have been very much so with me, and with my neighbors that I've talked to.

Q Are you aware of the fact that there some folks in the eastern part of the state who don't have that same experience?

A I do.

MR. SHENKER: Thanks, Mr. Brown. Nothing further.

HEARINGS EXAMINER: Mr. Meloy.

MR. MELOY: No questions.

HEARINGS EXAMINER: Mr. Graybill.

Rebuttal, Cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Where do you live, Mr. Brown?

A In Yellowstone County north of the Yellowstone River, about four miles north of the town of Worden.

Q Is Mr. Kemph a neighbor of yours?

A No, he's across the river some distance away.

Q An acquaintance of yours?

A Pardon?

Q Is he an acquaintance of yours?

A Yes, I've known Mr. Kemph many years.

Q Did you talk to him about coming up here?

A No, I didn't.

Q But you flew in the company plane by whom?

A A man by the name of Dale Heston.

Q I see, and what's his function?

A He works for Montana Power.

Q What does he do for them?

A He could answer that a lot better than I could, I'm sure, but --

Q Doesn't he buy right-of-way for them?

A I think so.

Q I take it the power company is paying your expenses up here today?

A Well, one of their men bought my lunch; I think that's the only expense.

Q Well, your transportation is also an expense, isn't it?

A That's right.

Q I notice on your statement some matters that I want to ask you about on page 2, line 16. You say that part of the -- you understand that part of the electricity is going to be exported and you haven't any objections to this, since we import things. Would you have any objections to exporting the coal so that the big power companies in the Pacific Northwest could generate electricity near their load centers?

A Well, it would add to my tax load.

Q To export the coal?

A Yes, it would because the extra line through my place would create more tax revenue in Yellowstone County. I have that objection to it. I would say, though, that probably the best way to arrive at that would be whichever is the most economically feasible.

Q Well, you're aware, I suppose, that there's a railroad right-of-way that runs all the way across Montana, two or three of them, in fact, and you're probably aware that the coal can be moved by rail. If you live down in that part of the country, you probably see the coal trains?

A That's right.

Q And do you live in a valley or do you live out in an open area?

A A higher area.

Q You're aware probably that in Western Montana particularly a lot of the farmers and ranchers live in valleys because the mountains are steeper?

A That's correct.

Q And where they have those mountain valleys and they already have a highway and in some cases the railroad, and in some cases some other utilities, you can probably appreciate the problem that that causes them in terms of cutting up their land for right-of-ways for various highways and utilities, right?

A I'm sure that's right.

Q And perhaps then you can appreciate that another 300 foot right-of-way added to those narrow valleys is somewhat of a disadvantage to them; couldn't you see that?

A I would say that was so.

Q And if the coal could be moved out of the state of Montana into Washington and Oregon where it could be burned and produce the same amount of electricity for the Pacific Northwest, you wouldn't have any objection to that would you?

A If that was the economically feasible way to do it, I would say that would be all right.

Q Well, and one of the questions of the feasibility would be whether or not we needed another 300 foot right-of-way clear across the state through these narrow valleys, right?

A That would have a bearing, yes.

Q Sure. There are other ranchers and farmers who have a tougher problem probably than you do. You talk about an esthetic problem, but they seem to have an even tougher problem than that because they have so many of these right-of-ways; you'd understand that?

A I can see where that would be a problem.

Q Are you familiar with the dangers associated with what are called EHV transmission lines?

A I don't believe I understand your question.

Q Well, EHV stands for extra high voltage, and there are a classification of power lines in this country known as EHV lines which are all power lines over 345 kV. That's called EHV. Now, are you familiar with the dangers associated with these EHV lines?

MR. ROSS: Objection. I think that assumes facts not in evidence.

HEARINGS EXAMINER: Overruled.

A I've heard a good deal about them, yes, pros and cons.

Q And you won't mind having an EHV line through your land in terms of its danger or the safety element?

A I understand that there are precautions taken which make them not too dangerous.

Q Are you aware of the fact that the Bonneville Power Administration puts out a special booklet that it gives everybody that has one of those lines telling them --

A I think I've read that booklet.

Q You have read the booklet?

A I've read something from Bonneville a year or so ago. I can't remember just what it was. I got if from the REA in Worden, I believe, or Huntley.

Q For example, are you familiar with the fact that you have to take special precautions to refuel your pickup under the power lines?

A I'm sure that would be a smart thing to do, yes.

Q Any of your land irrigated?

A Yes, I have some irrigated land.

Q Does this power line cross your irrigated land?

A No, it does not.

Q I see. Would it make any difference to you if it did?

A I'm sure it would make a difference. I don't know how much. It would depend on how much damage they did to the land, yes.

Q There have been some other farmers and ranchers here that have had lines go across their irrigated land, and they didn't like that. You'd understand that, wouldn't you?

A I'm sure that I wouldn't like it.

MR. GRAYBILL: That's all.

HEARINGS EXAMINER: Mr. Ross.

Rebuttal, Redirect, by Applicants

By Mr. Ross:

Q The views you express here today are your own; isn't that correct?

A That's right. I wrote this statement with no help from anybody.

MR. ROSS: No further questions.

HEARINGS EXAMINER: Mr. Shenker.

MR. SHENKER: Nothing, sir.

HEARINGS EXAMINER: Very well, you are excused, sir.

(WITNESS EXCUSED)

(RECESS AT 3:22 P.M.)

The hearing was reconvened at 3:30 P.M., following a brief recess.

MR. PETERSON: We'll call Dr. Wood.

DR. FRANCIS A. WOOD, called as a rebuttal witness by the Applicants, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. PETERSON: Mr. Davis, we present for testimony now Dr. Francis A. Wood. I have one correction to his statement on page 3, at line 11. The figure 6.25 should read as follows: 6.70 (range 4.8-8.8), and in the same sentence -- same line, next sentence, the word, "well," should be stricken. That's all of the corrections.

HEARINGS EXAMINER: Very well, sir, Mr. Sheridan, you may cross-examine.

(THE WRITTEN DIRECT TESTIMONY OF DR. FRANCIS A. WOOD WAS DIRECTED TO BE INSERTED AT THIS POINT.)

TESTIMONY OF

DR. FRANCIS A. WOOD

I am Dr. Francis A. Wood, of 1977 Ryan Ave., W., Roseville, Minnesota. Since 1972 I have been Department Head of Plant Pathology, University of Minnesota, St. Paul, Minnesota. I received a B.S. in Forestry from the University of Missouri, (1955), M.A. in Botany from University of Missouri (1956), and Ph.D. in Plant Pathology, University of Minnesota, (1961).

On page 35 of C.C. Gordon's Testimony "On the feasibility of siting the proposed Colstrip Units #3 and #4 at Colstrip, Montana", he states that "Doctors Wood and Pennypacker had obtained the abnormal disease syndrome on Scotch and White pines in their experiments by cheating and lying." Quite to the contrary, the experiments that Dr. Gordon refers to above were well planned and scientifically valid. Neither he nor anyone else has been able to discredit the studies or prove in anyway that they were contrived.

The following is a brief description of these studies including a statement of the major conclusions. The primary objective of the study was to determine if the long and short needle disease (abnormal disease syndrome) could be induced in pine seedlings by exposing them to branches from diseased trees in charcoal filtered air. Development of the disease under these conditions would indicate the diseased branches as the source of the cause of the disease and suggest the cause to be biological.

Pine seedlings were placed in chambers fitted with blowers and charcoal filters. The chambers were designed to provide charcoal filtered air to the interior under positive pressure. Seedlings were placed in these chambers during the early spring prior to bud break. Diseased branches (long and short needle disease) collected from diseased trees in the field were placed on the floor of the chambers and around the bases of the pots containing the seedlings. Upper portions of the seedlings were not in contact with the diseased branches. The seedlings were watered by using a system of tubes which delivered water to the soil surface in each pot in each chamber. The foliage was not moistured during watering nor was it necessary to open the chambers.

These experiments were conducted during 1971, 1972 and 1973. The results of the experiments were evaluated and examples of results were photographed. On the basis of data obtained from the 1971 and 1972 studies, the following conclusions can be made:

1. The long and short needle disease was induced in seedling of Scotch and eastern white pine maintained in charcoal filtered atmospheres and exposed to branches from trees with the long and short needle disease.

2. The long and short needle disease did not develop on seedlings placed in charcoal filtered air chambers that had not been treated with diseased branches (Experimental Control).

3. Lesions, similar to those observed on the bases of short needles from affected trees in the field, were observed on the bases of short needles that developed on seedlings in the exposure chambers.

4. The results further support the conclusion that the cause of the long and short needle disease in biological and not

air pollution.

5. The results of these studies in conjunction with field observations, field spray trials, data from the treatment of pine seedlings with acid solutions and ph levels measured in rain samples from the Mt. Storm, West Virginia area do not support the contention that acid rain is the cause of the long and short needle disease.

C.C. Gordon reported in a Department of Natural Resources Environmental Impact Statement that the average ph of rain samples collected in the vicinity of the ASARCO Smelter near East Helena, Montana was 6.25. This ph is well above that required to cause injury to pine needles in tests that we have conducted.

A summary of the field observations and studies referred to in item 5 above is presented in Appendix I in a paper entitled "Evaluation of the Effects of Air Pollution on Vegetation in the Mt. Storm, West Virginia - Oakland, Maryland Area", by F.A. Wood and S.P. Pennypacker. The paper was presented at the 68th meeting of the Air Pollution Control Association in Boston, Massachusetts, during June of 1975. (Applicant's Exhibit 2).

EXAMINATION OF DR. FRANCIS A. WOOD

Rebuttal, Cross, by Department of Natural Resources and Conservation

By Mr. Sheridan:

Q Dr. Wood, would you tell me what period of time you did work as a consultant for the Mt. Storm area?

A From about August of 1969 through the spring of 1974.

Q And at the time you were serving as a consultant in the Mt. Storm area, who were your employers?

A I was initially employed by Virginia Electric Power Company and later by the Allegheney Power Service Corporation and West Vepco and a couple of other companies in that group.

Q Monongahela Power Company?

A Yes.

Q Any others?

A I think West Penn Power was an owner of one of those power plants, also.

Q Well, serving as a consultant to those firms, did you do that in your academic capacity or did you do that through the vehicle of a corporation?

A Neither.

Q As a private consultant?

A Yes.

Q How much are you charging today?

A I don't think that's a legitimate question.

MR. PETERSON: You may answer the question, Dr. Wood.

A All right, $500.00 a day plus expenses.

Q Do you have an approximation as to the amount of money spent by the firms hiring you as a consultant in the Mt. Storm area for the purposes of your study?

A No, not exactly.

Q It's approximately half a million dollars, isn't it, Doctor?

A I don't think so.

Q Not that much?

A I don't think so. I really don't know, but I would guess it's less than that.

Q How much did you collect from VEPCO?

A I don't know.

Q How much did you collect from West Vepco?

A I don't know.

Q How much did you collect from West Penn Power Company?

A I do not know.

Q How much did you collect from Monongahela Power Company?

A I do not know.

Q You spent all this time from 1969 through 1974 and you can't tell us approximately how much you charge?

A I know how much I charge on an hourly and daily basis, but I do not know the totals. I could calculate them.

Q Oh, just give us an estimate.

A Rough estimates -- in the fall of '69, as consulting fees, I would guess $3,000.00, something on that order. In 1970, I really have no idea, Mr. Sheridan.

Q It was at your going rate right now, though, wasn't it?

A I beg your pardon?

Q Were those charges at your going rate?

A No, not at today's rate.

Q Inflation?

A Part of it.

Q Looking at page 1, commencing at line 27 of your statement, Doctor, and within those studies -- do you have that in your statement?

A Yes.

Q Within the studies that you carried out for the VEPCO power company during 1969 until the fall of 1973, and that includes both your field studies and the exposure studies of Scotch and White Pine seedlings to the infected branches which you describe in your testimony, commencing here at line 27 on page 1, you came to the conclusion that the growth abnormality known as the short-long needle syndrome of Scotch Pine, Eastern Pine, and Virginia Pine, was caused by a biological agent, isn't that right?

A True.

Q And that was not caused, in your opinion, by acid precipitation?

A True.

Q And that's contrary, of course, to the opinion held by Dr. Gordon, correct?

A Correct.

Q Would you present for the record today the name of the biological entity which you believe, based upon reasonable scientific certainty, caused the short-long needle syndrome to the above-named coniferous species?

A I do not know the specific biological entity, nor have I claimed that I did.

Q You don't know what the biological entity is, but you know that it's not acid rain, is that right?

A That's my opinion at this point.

Q You make this statement, Dr. Wood, on page 1, commencing at line 16, regarding your work, and you say: "Neither he (and you're referring there, I think, to Dr. Gordon), nor anyone else has been able to discredit the studies or prove in any way that they were contrived." Did not a part of your studies involve the damage to Christmas trees of the Marshall Stacy plantation in the Mt. Storm area?

A Would you repeat the first part of the question, please?

Q Isn't it true, Doctor, that a portion of your studies involved the damage to Christmas trees on the Stacy plantation in the Mt. Storm area?

A Yes.

Q And isn't it a fact, Doctor, that your particular view apparently was discredited because it was not taken as true by Judge Lewis and the Federal Court of Alexandria, Virginia?

A No.

Q Isn't it true, Doctor, that only you, as a plant pathologist, testified for the power company and Dr. Gordon was the only other plant pathologist who testified before Judge Lewis?

A I think that's correct.

Q And wasn't Judge Lewis's opinion consistent with the opinion rendered by Dr. Gordon, and not you?

A That's true, but that still does not make my opinion scientifically not-valid.

Q You're stretching it just a little bit, aren't you, Doctor, on page 1, line 16, when you say, "neither he nor anyone else has been able to discredit the studies"?

A I was referring to the scientific community in that statement.

Q So you're qualifying that, then, aren't you?

A Yes.

Q And you can't tell us what the causal agent is, but you just know that it's not what Dr. Gordon says it is, right?

A I have quite a lot of evidence that suggests and substantiates my position, that is correct.

Q Tell me the name of the biological entity, then, Doctor, if you know.

A I cannot. I think I told you that earlier.

Q On the last page of your statement, Doctor, you mention the paper entitled "Evaluation of the Effects of Air Pollution on Vegetation in the Mt. Storm, West Virginia - Oakland, Maryland Area," by yourself and Dr. Pennypacker. This was, of course, presented at the 68th meeting of the Air Pollution Control Association in Boston during June of '75, correct?

A Correct.

Q That testimony given at the presentation in Boston was based upon your 1971, 1972 and 1973 exposure studies, was it not?

A No, just the 1971 and 1972.

Q And those were the studies that involved the charcoal-filtered atmospheric chambers which were located on Dr. Pennypacker's farm in Pennsylvania, were they not?

A Two of the three, right.

Q Two of the three were?

A Two of the three studies of that particular group were the basis for what was said at the Boston meeting.

Q What did you do that was the subject of the presentation in Boston that was not involved on Dr. Pennypacker's farm in Pennsylvania?

A May I rephrase the question, or would you?

Q Sure. What did you do that did not involve your studies on Dr. Pennypacker's farm for that paper?

A That was presented in my paper?

Q Right.

A A variety of things. Beginning back in 1969, I evaluated the number of the Christmas tree plantations under -- well, they weren't under litigation at that time -- a number of plantations which growers had made claims about. I subsequently examined materials from those plantations. In October of that year, 1969, I discovered the lesions under the fascicle sheaths of pine needles. I was the first one to report this particular type of injury to the base of the needles in that particular situation.

Q The first man to ever do that, right?

A In the Mt. Storm situation, I was the first one, yes. Then, in that winter, Dr. Pennypacker and I surveyed an array of plantations in northern Pennsylvania, trying to determine the general distribution of this particular problem; was it very common, did it occur in areas with relatively low levels of pollution, and so on. I used the data we obtained from that particular survey in the Boston meeting. The following spring, after examining materials from the field, and so on, and seeing clues or symptoms which suggested an insect or an insect-type organism might be responsible, we contacted entomologists at North Carlina State University, one in particular, Dr. Farrier, and in the spring of 1970, Dr. Farrier, myself, and a couple of other people set up some spray trials at the farm, which had been previously purchased by VEPCO in the Mt. Storm area. Some of those data are presented in the Boston paper. The results of spray trials the following year that were conducted by Dr. Farrier are alluded to or referred to in my paper, the calcium oxide sprays, specifically, as I recall. The following year --

Q What year is that?

A This would be 1971. Throughout 1970 and 1971 and 1972, in general, I visited the tree farms under question about twice a year. Some of them I visited more often. Some of the other areas,for instance, the VEPCO farm, I visited many more times each year, but data from observations made during those periods were also utilized in the Boston report. I made trips. I went to Europe, for example, in 1970, I think it was -- '71 or '71 -- I attended an international conference on air pollution, presented a paper, looked around the Ruhr Valley of Germany. I made trips to Minnesota, Wisconsin, and in these trips, I looked for the long-short needle disease.

Q Dr. Woods, on December 12th, 13th and 14th, 1973, you presented through a deposition taken by Mr. Geoffrey Vitt, who was the counsel for Virgil T. Stoyer, S-t-o-y-e-r, in a case by Stoyer against West Penn Power Company and the Monongahela Power Company in Minneapolis, Minnesota, all of the data and photographs obtained from the three years of exposure studies at the Pennypacker farm, didn't you?

A I was deposed, right, in this case.

Q And Dr. Gordon was also present at the time your deposition was taken?

A That is correct.

Q And subsequent to that, did you make available to Dr. Gordon for his inspection and study all of your raw data from these studies, as well as all of the photographs which you took, or these exposure studies?

A I made my files available to the attorneys and Dr. Gordon when they were at my office and in the twin cities.

Q And you made available all of your photographs except one tray of photographs which you lost?

A I remember the discussion about a tray of photographs that we could not determine the exact status of at that point. To this day I do not know.

Q Dr. Wood, during your presentation at the Air Pollution Control Association meeting in Boston in June of 1975, did you show several pictures of your exposure shelters and the resulting long-short needle syndrome?

A True.

Q And that involved Scotch Pine and White Pine and exposing them to diseased branches collected from the field that exhibited short-long needle symptoms?

A True.

Q Dr. Wood, what I'm going to do is show you some of those pictures which you presented at that meeting and have you explain a little bit about those pictures.

A Is this the meeting in Boston or the deposition?

Q The pictures from the deposition and the meeting.

MR. PETERSON: I think the record ought to show that Dr. Gordon is going to run the machine.

HEARINGS EXAMINER: Let's see how the pictures turn out before I rule on it.

Q Doctor, the first slide that I'm showing you is from your deposition and identified as 73-32 -- or 73-33. Would you explain what we're looking at here?

A That's a view of four of the chambers that we constructed and utilized to expose transplants from the Laurel Run tree farm, which is a tree farm new the VEPCO power plant that did not possess the long-short needle disease as of the last time that I looked at it.

Q And that is a picture taken of your fumigation chambers, correct?

A Dr. Pennypacker and colleagues of mine built these, but they sure look like ours.

Q That's an accurate reproduction of what the conditions were as of the time the picture was taken, isn't it?

A An accurate what?

Q An accurate reproduction of what the conditions actually portrayed at the time the picture was taken? Is it a good picture?

A It shows the chambers.

Q It's not distorted or it doesn't misrepresent anything, does it?

A To the best of my knowledge, no.

MR. SHERIDAN: We'll ask that this be marked DNR Exhibit 245 and we'll make duplicates available to the Board.

Q Go to the second slide, please. The second slide, Doctor, from your deposition was identified as 73-36, and we'll ask that it be identified as DNR Exhibit 246, and would you explain for the record what we are looking at here?

A May I stand?

Q Sure thing.

A This is a view of the interior of one of the smaller chambers that we used throughout the three years of exposure studies. They were approximately 4 x 4 cubes. This is a view of seedlings. This is a view of pots in which there are seedlings. This is one of the watering tubes going into one of the pots. This is how the plants were watered, and the branches you see here represent the branches from diseased trees in the field that were brought in as sources of inoculum, in quotes.

Q And how do you believe, Doctor, that the biological entity as yet unnamed gets from the damaged foliage or placed in the exposure chamber up to the emerging Scotch Pine needle candles which are emerging on the Scotch Pine seedlings in the picture there?

A I do not know, but there are a couple of possibilities, (1), the material may be carried, or the organism, may be carried from the branches up in the airstream, or they may crawl up or fly up if insects, such critters, are involved. If some of the spores are involved, it would have been airborne movement.

Q You don't know, though?

A I do not.

Q Let's go to the third slide, please. The third slide, Dr. Wood, is your photograph from your depositions 73-82, that I'll ask to be identified as DNR Exhibit 247. Would you explain for the record, Doctor, what is shown in this photograph? Perhaps I can refresh your recollection. Isn't that a seedling placed in the chamber during 1972 which had diseased branches?

A It could be. Just by looking at this slide, I cannot tell you which year. I suspect -- and I repeat, I suspect -- that this was from 1973 and that this was a plant that had been exposed to infested branches in 1972 and not again in 1973, or it could have been one that was exposed to infested branches in '71 and not a second time, then, in the 1972 study. We had that treatment in the 1972 study. I cannot identify it specifically.

Q Would it help you if you reviewed the transcript of your testimony at the time of your deposition was taken?

A It might.

Q Would you like to come over and take a look at mine, because I realize you don't have yours.

A May I say that that's just one of the possibilities I mentioned?

Q Well, it is, in fact, what your testimony says, based on the deposition you gave, is it not?

A Yes.

Q Now, this is a twig of a Scotch Pine that received an infested branch material in 1972 and was held in a check chamber during 1973, based upon your deposition testimony, right?

A May I check something?

Q Sure.

(WITNESS GOES THROUGH RECORDS.)

A Yes.

Q Doesn't this show that the short-long needle on the 1972 stem growth during 1973 placed in the chamber the absence of short-long needles on the 1973 growth?

A You're going to have to say that one again, because it's confusing to me.

Q Doesn't that show to you that the short-long needle on this 1972 stem growth that was placed in the chamber in 1973 does not show short-long needle symptoms on the 1973 growth?

A From here, I don't see any obvious ones. The only symptom that is apparent here that's consistent with the long and short needle disease in the field would be the dwarfing, or the reduction in size of the twig, the branch.

Q Just for the record, on the photograph, the bore area of the branch is where the '73 needles began to emerge toward the end, right?

A Unless there's something obscure in here, and I don't think there is, this is the '73 growth from about this point to here (indicating). This is a Scotch Pine. These needles, in general, would be younger than the ones near the tip of the twig.

Q Doctor, during your 1973 deposition, you explained that at the completion of your 1972 chamber experimentation that the trees -- and that's the conifer seedlings like this -- were taken out of the chambers and stored outside in Dr. Pennypacker's barn until the following spring, when this new 1973 experiment was started, isn't that correct?

A I think I testified that the cages were stored in the barn and that the seedlings were stored outside in relatively protected areas adjacent to the barn, the house, and some other sheds.

Q But they were not in any controlled chambers in the interim, were they?

A That is true.

Q Did you spray with insecticides the seedlings you used during the previous years in chambers with the diseased branches, thus obtaining the short-long needle syndrome prior to putting them into control chambers for the 1973 experiments?

A I think I got that, but please, one more time.

Q Sure. Did you spray with insecticides the seedlings you used during the previous years in chambers with diseased branches, thus obtaining the short-long needle syndrome prior to putting them into control chambers for the 1973 experimentation?

A I still don't understand your question.

Q Okay, let's see if I can make it any more clear. Did you spray that between 1972 and 1973?

A No.

Q Then can you tell me for the record, Dr. Wood, why the biological entity that caused the short-long needle on the foliage of this branch, 73-82, which is DNR Exhibit 247, during 1972, didn't have whatever entity it was, fly, walk, or crawl up to the 1973 growth as it commenced in the control chamber during the spring of 1973?

A I can't tell you exactly, but our explanation is as follows: The organism that we suspect here, the adelgid, or aphid, is one that according to the entomologists, is a cool weather insect. Its population peaks in early spring. Now, these plants were held in the enclosed chambers that were showed here all summer long. It is possible that the populations dropped off because of increase in temperature, higher temperature in the chambers. Now, I don't want to give the impression that the temperatures were abnormally lethal, because our check chambers had seedlings in them that grew and performed very well. Another possibility is that there are predators of this particular aphid, and if the aphid was the cause, the predators could have been brought along with the infested branch material and eliminated or reduced the populations. The third possibility is that we know in most experiments that a certain concentration level of inoculum is required before a disease will develop. This applies to spores as well as insects, mites, and so on, and it may be, since we did not replenish or add inoculum at the beginning of 1973 that there was just not enough inoculum to cause the kind of symptoms and the severity of symptoms that we saw in 1972.

Q You have not identified the biological entity, though, have you?

A For the third time, I have not.

Q Do you know Dr. V. Baker? Didn't Dr. Baker work with you?

A A Dr. Baker -- I don't think his initial was V.

Q Okay, what was it?

A I'm trying to think -- Jim.

Q What was his conclusion about mites causing the short-long needle syndrome?

A I think -- the last time I talked with Dr. Baker, his conclusion was that the mites were not responsible for this problem and that he was going to do additional tests. I don't know if he has or not.

Q He has not informed you, and you have no knowledge of any opinion of his contrary to what you just testified to, right?

A That is correct.

Q Do you have any idea, Doctor, how many of the biological entities are necessary to cause a single needle to be dwarfed?

A I do not.

Q Do you think it takes more than one of these biological entities to cause a needle to be dwarfed?

A If it's an insect like the adelgid that we suspect, no.

Q Is an adelgid an insect?

A An adelgid, as I understand it, is an insect, a type of aphid, which has piercing and sucking mouth parts.

Q Is it what is known scientifically as Pinus Sylvestris?

A I think that's one.

Q In essence, then, Doctor, you're telling us that it takes probably more than one of these unknown biological entities to cause a needle to be dwarfed, but during your three years of chamber experimentation, that's 1971 to 1973, you and your assistants were unable to isolate or identify these biological causal agents, even though you may have had thousands of them present, is that right?

A No. 1, an adelgid, or an insect of the type that we've been talking about, in the right place, could cause a needle to be dwarfed. No. 2, my colleagues and I at Penn State did not attempt to identify a specific causal agent. That is correct. These studies were set up simply to determine if we could induce the long and short needle disease in conifer seedlings under charcoal atmosphere conditions and this we did in three successive years.

Q Doctor, when Dr. Gordon was questioned by counsel for the power company about this particular photograph in your presence, he claimed that the photograph depicted short-long needle disease from the previous year's growth, which was caused under field conditions, and that the stunted current year's growth was caused by transplant shock when you moved the trees from the field back to the chambers during 1973, is that right?

A That is not right. I did not move -- what is your question?

Q Do you know what transplant shock is, Doctor?

A I have an idea, yes.

Q Okay, what does transplant shock do to a tree?

A There are a number of things, one of which is to cause a reduction in branch development and needle development, or branch length and needle length.

Q It's rather common, isn't it?

A In transplanted plants, yes.

Q What do you think caused the dwarfing in this 1973 growth in this branch?

A I do not know. I know that this kind of dwarfing is associated with the long and short needle disease in the field in most areas where I have observed it, and I do know that we observed this and the full array of symptoms on both the lower limb transplants and earlier seedlings in addition to this one that had been either exposed in successive years to the branches or exposed one year to branches the second year or not. I do not know specifically what causes the reduction in branch length.

Q Let's have the next slide. Dr. Wood, this is your photograph on that same deposition identified as 72-120, which I'll now ask be identified as DNR Exhibit No. 248. What is depicted in this photograph?

A As I remember, this is a view of the Scotch Pine that had been exposed to infested branches during 1972 and a rather severe case of the long and short needle disease developed in the -- I'm sorry. Let's start over. This is a view of a Scotch Pine that had been exposed to branches from diseased plants in our chambers during 1971 and a severe case of the long and short needle disease developed in this, the 1971 growth. As I recall, the following year, this seedling, along with several others, was placed in a chamber without branches. The growth was fairly normal. There was very extensive defoliation of the needles that had been among those possessing the long and short needle disease symptoms from the 1971 exposure. The point is that needles affected by the long and short needle disease cause do prematurely fall or are prematurely cast, and we had plants similar to this where the preceding year's growth, the 1970 growth, was normal. This growth looked about like this, and the '72 growth, again, fairly normal.

Q And would you explain how or why all of the long needles on the affected 1971 branches have tip necrosis?

A I can tell you why I think they have tip necrosis, yes, for the same reason that many of the short needles and some of the long needles in the field have tip necrosis, and that is, the injury to the base of the needle under the fascicle sheath in many instances interferes with the flow of water and nutrients. All right, that is essentially a drought effect. The movement of water into the needle is reduced or eliminated and that, in my opinion is why we see the tip necrosis here, and I do know, from observing plants in August and then later on, a month or so later, that this tip necrosis tends to develop from the tip back, which is typical of drought injury.

Q Okay, Doctor, in the previous picture, that was 73-82, DNR Exhibit 247, the tip necrosis did not seem to be occurring to either the long or the short needles of the 1971 growth, which, according to your description or explanation, received the same treatment as the conifer seedling. Can you explain why it happened to this seedling and not to the previous ones shown in your 73-82 picture?

A I can explain it on this basis. We see the same sort of variability in the field. They're two different plants, two different seedlings, two different genetic combinations or genetic makeups, and it is not surprising that they would respond differently. It's rather common.

Q Would you explain for the record how the transport of water in the xylem tissue of the basal needle tissue of a damaged, dwarfed needle of Scotch Pine can be prevented from not reaching the needle tips and you reach the midsection of these needles so they remain green and alive?

A I was talking about amounts and I said either eliminated or reduced, and some water was obviously getting through, because the needles did remain green up to a point, but I believe that there was a reduction in water flow in these as a result of interference with the tissues in the base of the needle.

Q That's a belief. You don't know, do you?

A That is a belief. I said that at the outset.

Q Dr. Wood, did you carry out any histological study on the base of these 1971 damaged needles to ascertain the damage to the tissue by this unknown biological entity?

A No.

Q Now, Dr. Gordon has previously claimed that you or Dr. Pennypacker used a solution of strong acid to obtain the 1971 short-long needle syndrome depicted in this picture of yours and that the acid had caused the tip burn on the long needles, and you disagree with Dr. Gordon on that point, right?

A Obviously. He claimed many things, but they aren't necessarily true.

Q Okay, could I have the next slide, please? I'll represent to you, Doctor, that this is not one of your pictures, and the only question that I have concerning these two Scotch Pine branches and their needles is to ask you whether or not you see any difference in the condition of the needle fascicles on the branch on the left and the branch on the right?

A Some, yes.

Q What is the difference?

A Some of the fascicles on the right are being sluffed.

Q And do you think that the unknown biological entity you and Dr. Pennypacker worked with in your exposure chambers caused the same or a similar type of damage to the fascicles as is depicted in this picture?

A I do not know.

Q Next slide, please.

HEARINGS EXAMINER: Did you mark that one?

MR. SHERIDAN: Please identify that previous one as DNR Exhibit 249.

HEARINGS EXAMINER: Right.

MR. SHERIDAN: This slide will be DNR Exhibit 250, which has been previously identified, Doctor, in your deposition as 72-112.

Q Would you describe for the record what this photograph, identified as DNR 250, depicts?

A Well, it looks like one of my slides.

Q Right.

A It looks like one of our slides of a twig from one of our branch exposure studies.

Q I'll represent to you, Doctor, that it's your slide 72-112, and it's a closeup of one of the twigs of the Scotch Pine from the treatment chamber. Does that refresh your recollection?

A Yes, I would agree with that.

Q What do you see, Doctor, insofar as any similarity of this disarranged vascular sheath in this photograph of yours and the vascular sheath on the right side of the previous photograph, which was DNR Exhibit No. 249?

A There appears to be a fascicle leaf defoliation or removal here. I have seen the same thing in Scotch Pine following our ozone exposures. I've also seen it in plants that have not been exposed to ozone in our control chambers.

Q Do you think that this unknown biological entity which causes the short-long needle in the Mt. Storm area causes this damage to the vascular sheath?

A It may or may not.

Q You don't know?

A No.

Q Have you ever carried out any histological studies, Doctor, to determine what causes this damage to the vascular sheath? which you are observing in your photograph 72-112, also identified as DNR Exhibit No. 250?

A No, I have not. I would like to comment that I don't think one can use histological studies to determine cause in a disease situation.

Q How do you study a cross section of a needle microscopically without a histological study, Doctor?

A There's no way you can study the cross section of a needle without sectioning it histologically. That is not what I said. I said that with histological techniques, it is not possible to determine cause, and that is different from determining disease. A good example is cancer in people. My good friend, Dr. Gordon, uses this example in the Mt. Storm Abatement Conference. He says that he can identify and diagnose cancer. Well, with histological techniques, cancers in tissues can be identified as a disease, but the cause has not been determined by histological techniques. A whole array of different kinds of studies need to be performed. Sometimes histological studies help.

Q You're not prepared to stand here today under oath, Doctor, and tell us that by studying cell deterioration histologically, one cannot determine what the causal agent was that destroyed the cell, are you?

A I am.

Q You will say that?

A Categorically. I made one concession at the end, that histological studies help, but to determine cause, the basic approach is Koch's Rules of Proof to identify an organism or a pathogen that may not be living with a disease system, to isolate that particular organism and/or -- in the case of pollutants -- a biotic agent, a biotic pathogen -- to, in the sense of laboratory technology cultivate it or establish it in pure culture -- next step, to apply that particular agent to the suspected host or suspect, caused the symptoms that one observed at the outset, observe the total disease syndrome, and reisolate or identify what the cause was -- now, within that sequence, histological evaluations are useful, but there are many other factors involved in determining the cause of a given disease.

Q This is one of the tools, isn't it?

A It's just one.

Q And how did you use Koch's postulate in handling your unknown biological entity?

A What we did was what has often been done in such studies. We did not know the specific cause. We suspected a biological agent. The study that we set up, if we had gotten a negative result, would have suggested something other than a biological agent with a couple of exceptions. The soil could have been the source, and our next plan, or one of our next planned studies was to expose plants to soil by bringing soil in from the field and placing it around the base of the chambers and so on.

Q Can you tell, looking at those needles, grossly, what the effect of exposure was upon the resin canals?

A No. I didn't say that I could.

Q It would help you if you had histological studies, wouldn't it?

A Not in the sense that we set up this study. There's no clear, well-defined description of what constitutes the full range of anatomical changes in the base of a needle associated with this problem. Dr. Paul Nelson, a plant pathologist, histologist and a very well-known one, at Penn State, has done some work on this. He's published -- presented a couple of reports to VEPCO. I think Dr. Gordon and others have seen them.

Q Was he hired by VEPCO, also?

A He was hired by VEPCO initially, and he did some work on a grant from the Allegany Power Service Corporation to the university on the Allegany Power Service case.

Q Doesn't Koch's postulate say that first you identify the pathogenic organism?

A Or a suspected one.

Q Which one have you done?

A We suspected a biological entity. That's as far as I've carried it. I think I've made that rather clear, and it's not unusual for a plant pathologist to identify a suspected causal agent such as in the area of virology, make tests, and find that the specific virus or viroid that they have isolated is not the one causing the problem, but as a general procedure, I will stick with what I've said.

Q Did you have all these pathogenic organisms trapped in a chamber?

A Well, we had those trapped that could not escape through the air outlets from the top of the front row of the cabinet, and as I recall, there was cotton placed in those as a filter. The system was under positive air pressure.

Q Dr. Wood, this next slide is the same photograph you looked at previously two slides ago, DNR Exhibit 248, where one Scotch Pine branch had been disarranged or had a disarranged vascular sheath, but the other branch appeared normal. Would you read for the record the caption beneath each of the two branches and indicate for the record the caption for the normal vascular sheath and the disarranged or diseased vascular sheath?

A The caption reads "Pinus Sylvestris, or P. Sylvestris -- Control UM"-- I assume that's University of Montana, Botany Greenhouse. The next caption under the twig on the right reads "one over 500, Amitox 4 days, pH 4.5, 2/12/76 - 2/27/76."

MR. SHERIDAN: I'll ask that that be identified as DNR Exhibit 251.

Q Dr. Wood, from 1961 until the present time, have you ever read any of Dr. Gordon's testimony or reports to EPA where he implies or states that he believes you are a liar?

A I read the transcript of his deposition in the Monongahela case. I just scanned it twice. I did not see anything in there where he called me a liar or a cheat. All right, he might have disagreed, but there's a tremendous difference.

Q Do you remember a critique that Dr. Gordon did of your's and Dr. Godische's work which you presented at the Kaiser West Virginia EPA Abatement Hearing in 1971?

A Yes.

Q And if I read to you the last paragraph of the last page of that report, would that remind you of what he thought of your scientific ability and scientific integrity at that time?

A I know what he thinks of my scientific integrity and ability and all I'm asking him or anyone else to do is prove that we did not do these three sets of studies or the other things that we claimed.

Q What does he think of your scientific ability and scientific integrity?

A I think you should read it.

Q I will. Maybe this will refresh your recollection. "Dr. Wood's false and misleading statements have angered the citizens of the Mt. Storm area. He has aroused in numerous people a mistrust of the academic world. This is an extremely disheartening situation which can only be rectified if Dr. Wood apologizes to the citizens of Mt. Storm for the unprofessional statements in his report." Does that refresh your recollection, Doctor?

A Yes, keenly.

MR. SHERIDAN: Nothing further.

WITNESS: I disagree, obviously.

MR. SHERIDAN: You have a vested interest. Nothing further.

WITNESS: I have one more comment to that. I have more than a vested interest. First of all, Dr. Gordon has not proven that I made any untruthful statements in the reports that he refers to, so he misrepresented that. No. 2, I am the head of Plant Pathology at the University of Minnesota. I was appointed to this position about 3½ years ago, and I think my credentials stand on the basis of that appointment very high in the scientific community.

MR. SHERIDAN: Nothing further.

HEARINGS EXAMINER: Mr. Peterson.

Rebuttal, Redirect, by Applicants

By Mr. Peterson:

Q With regard to your work with the University of Minnesota, how many people do you supervise?

A At the present time, we have 35 to 36 PhD's on the faculty and about 35 students, graduate students, about 70 undergrads in our plant health technology major, and approximately 40 support personnel.

Q Has anyone else with whom you have come in contact other than Dr. Gordon ever called you a liar or a cheater among your professional colleagues?

A No.

Q Dr. Wood, you have done a lot of work, have you not, in your area of plant pathology for companies other than VEPCO?

A That is true.

Q Have you done any work for the Pennsylvania Electric Company?

A Yes.

Q And what did you do for them?

A Okay. In 1962, I was asked to examine the vegetation in the vicinity of the Shawville plant, in Shawville, Pennsylvania, by the Pennsylvania Electric Company. I did that and in a report submitted to the company, pointed out that they were causing what I considered to be air pollution injury to the surrounding vegetation.

Q Did you report that to the company?

A Yes.

Q Have you done any work for Corning Glass?

A Yes.

Q What was that?

A I've done several jobs for Corning Glass, one in the Bradford, Pennsylvania area, where one of their plants, which produced lenses for large microscopes was putting out hydrochloric acid gas. One particular year, they increased productivity, defoliated about half the vegetation in Bradford, killed many plants, and I was asked to come up and evaluate the problem. I did. I made recommendations to Corning to the effect that they were causing a problem. I outlined the degree of it, and I actually made damage estimates on the woody ornamentals and shade trees in several locations and they settled several suits on the basis of my review.

Q Have you done any work for the Metal Wire Recovery?

A Metal Wire Recovery? Yes, another organization, an outfit that was recovering copper wire by burning polyvinyl chloride insulation in open field burning. They were accused of causing a problem. I was asked to examine this. I did. They were causing a problem. I reported this to the company and they settled out of court.

Q Have you done any work for the National Park Service?

A Yes, on two different occasions. One, I was asked to go to Death Valley Monument and examine the desert hollies. There is a problem of decline of desert holly. It was suggested that it was due to pollution, presumably pollution from the Los Angeles Basin. I examined that and reported to the Park Service that I did not think it was due to air pollution.

Q What was the second job for the National Park Service?

A I was asked by the office of the chief scientist to evaluate the southwest energy complex area. I spent a week examining the area in general and submitted a report on my recommendations regarding the impact of those power plants on the ecosystems. My comments were, as I recall, that there would be a minimal sulfur dioxide problem, for a number of reasons, but that from a visibility and aesthetic standpoint, they were going to have difficulties because of the particulate matter being released into the atmosphere. This was about 1970.

Q Now, with regard to each of the consulting jobs that you've held with Pennsylvania Electric and Corning Glass and the Metal Wire Recovery, did you ever make a determination in each of those instances whether the present level of standards, as we know them now, were, in fact, violated by the operation of those plants?

A The only ones we knew there were no standards for were a couple involving sulfur dioxide, and in those instances, yes, primarily on the basis of the array of vegetation affected, the array of species affected, would suggest that the standard had been violated.

Q When you were describing on cross-examination that a Dr. Paul Nelson had made some findings which he reported to VEPCO and others, you were stopped short relative to the explanation of those findings. What were those?

A Nelson reported to VEPCO -- and I think these reports are available, but I'm not sure, in the Stacy trial record, that he found the mouth parts of insects in the young, developing candles and of twigs that had short needles and in the cataphylls or leaves of the fascicle sheath, and he included photographs in his report.

Q Would that be consistent with your theory?

A Yes.

Q What is the effect of creating the charcoal filter condition in the greenhouses?

A You mean in the exposure chambers?

Q Yes, the exposure chambers.

A Depending on the type of charcoal used, one can eliminate or reduce the concentration of various air pollutants. We were working in a rather clean area out in central Pennsylvania, but as a precaution, we used charcoal to insure low levels of air pollution inside the cages.

Q Were there other slides taken by you of the work that you've done in these hothouses or in these plant houses?

A Yes.

Q Did you bring them with you?

A Yes.

Q Would you pull out a couple of the photographs which indicate the short-long needle syndrome from the affected areas in the plant houses, in the chambers, as opposed to those that you found in the field?

A Okay. It will take a few minutes.

(PAUSE WHILE WITNESS PROVIDES SLIDES.)

MR. MELOY: Let the record show that the witness is showing the slides here, Mr. Davis, at the request of Mr. Peterson.

HEARINGS EXAMINER: Again, I'll reserve any statement until we see how he puts them on the screen. If they're upside down, we'll be a little suspicious.

A I'd like to review in an orderly fashion what we did in these studies. The chambers, as you see in some of the other slides, were equipped with blowers at this point. The base of the chamber is essentially a small plenum. The plants were sitting on a piece of pipeboard. The air flow was from the bottom to the top and out these orifices in the front wall.

HEARINGS EXAMINER: Just a moment, sir. Are you going to mark this as an exhibit?

MR. PETERSON: Yes, I am. I would like the next number.

HEARINGS EXAMINER: 321, I think, would be your next number.

MR. PETERSON: All right, we're now looking at Applicants' Exhibit No. 321.

A The seedlings, six per chamber, were placed in the chambers prior to bud break and infested plant material or diseased branches from short needle trees in the field were collected, placed in the chambers at various times throughout the early phase of the exposure. I have already explained the watering. Next --

MR. PETERSON: We'll mark this Exhibit 322, Mr. Davis.

A The next slide shows -- and if the lights were off, it would show better -- the diseased branches. We placed twigs on the tops or laid them on the floor of the chambers, but we did not bring them in contact with the upper portions of the seedlings. Next -- this was how the watering was accomplished. If you look at the surface of a pot, this is a lid weight on the end of one of the watering tubes.

MR. PETERSON: We'll call this Exhibit 323.

A The tubes were all connected to a manifold in the water supply and Dr. Pennypacker or his wife -- mostly Dr. Pennypacker -- went out whenever needed and watered the plants.

Q What is the significance of this type of watering system?

A It keeps moisture off the foliage of the plants. The water just trickled out of this tube into the soil.

Q Next?

MR. PETERSON: This is Exhibit No. 324.

A This is a view from the first exposures of 1971. These twigs were removed from the plants and photographed in June. I do not know the exact date. This is a twig from a chamber that did not receive infested branches. This is a twig from a chamber that did (indicating).

Q The one on the right is a twig from the chamber which did?

A Receive infested or diseased branches. This was a twig from a checked or controlled tree, from a controlled chamber (indicating).

MR. PETERSON: All right, the next exhibit, No. 325.

A These photographs were taken later during August of 1971, and again, they show, in this case, a Scotch Pine check on the right, with normal foliage development and a seedling, or branches of a seedling that had been exposed to the diseased twigs in the chamber.

MR. PETERSON: Exhibit 326.

A This was taken at sundown or thereabouts, and I was shooting against the skyline to show the effect, but you can see, this is the other part of a seedling --

Q You're now pointing to the lefthand side of the photograph?

A Right, right. This is a seedling from a chamber that received the diseased branches. The one on the right, the twig on the right was from a check chamber or control chamber. Next? The same sort of situation, branches on the left from a chamber that received infested branches, twigs on the right from a chamber or seedling that was in the check.

MR. PETERSON: And this would be Exhibit 327, and now Exhibit 328.

A Going to 1972, we simply expanded the study to include a dozen cages instead of six and we expanded the number of species from 1 to 2 and included Eastern White Pine this year. The short needle disease was observed on Eastern White Pine in the Mt. Storm area and other areas, as well. It's also been observed on other species, but this year, we used Scotch and Eastern

White Pine. We placed three Scotch Pines, three Eastern White Pines, in each cage. There was a variety of treatments which are described in my report. This represents a view -- one other thing we wanted to demonstrate as a result of the '72 exposures was that branches from different plantations could cause this symptom, so the seedlings in a given chamber only received infested branches from one source, one source plantation; for example, these came from the Potomac Camp Road plantation, which was down in the Mt. Storm area. These seedlings -- this seedling and its brothers and sisters, depending on how you look at it, the other five in this chamber, only received diseased branch material from the Potomac Camp Road throughout several exposures. You see the long-short needle disease symptoms? The specimen on the right -- twigs from a seedling from a check or control chamber.

MR. PETERSON: Now Exhibit No. 329?

A The same series, the same year, but a different source -- this is the Custer Stony Farm, one of the farms under litigation in the Mt. Storm area. Again, this particular seedling received infested branches from that source. This one was from one of the check chambers, the one on the right.

Q What is the significance of the difference of the one on the left as opposed to the one on the right?

A This was from a chamber that was treated with infested branches from a diseased tree and that's from one of our check chambers.

HEARINGS EXAMINER: Is that one you had before now?

MR. PETERSON: No.

WITNESS: No, sir, this is a different one.

HEARINGS EXAMINER: Wouldn't that be 330, then?

MR. PETERSON: 330 is coming up.

MR. SHERIDAN: This is 329 that we're referring to now?

MR. PETERSON: Yes.

MR. SHERIDAN: May I ask a question?

HEARINGS EXAMINER: Yes.

MR. SHERIDAN: Is there any tip necrosis on that one on the left?

WITNESS: Yes.

Q Do you have any idea of the cause of the tip necrosis?

A The same explanation that I gave earlier. These plants were maintained under charcoal-filtered atmospheres from the time the bud produced this twig, emerged in the spring, until this photograph was taken.

MR. SHERIDAN: Is there any shield sluffing on that one?

WITNESS: I assume you mean sheath sluffing?

MR. SHERIDAN: Sheath sluffing, pardon me.

WITNESS: Well, from right here, I don't see any.

(WITNESS EXAMINES SLIDE MORE CLOSELY.)

There is a suggestion of some at this point on the seedling that was in the control chamber.

Q And you're pointing to the righthand side of the photograph?

A Right.

Q Now may we have Exhibit 330? What is Exhibit 330?

A This is just a closeup -- again, if the lights were off, it would look much better -- showing a rather severe case of the long and short needle disease and the initiation of tip necrosis in many of the needles. This was from the 1972 study.

Q And the next exhibit?

A This is Eastern White Pine. The slides to this point have been of Scotch Pine. Eastern White Pines, placed in the same chambers, where the inoculum was from Scotch Pines or the diseased branches were from Scotch Pines, and in this case, a plant that was in the chamber, where the inoculum came from the Custer Stony Farm, this Eastern White Pine showed short needles, as you see here.

Q And this is Exhibit 331? Yes. Is there another exhibit?

A Yes, I think there's at least one more.

Q Applicants' Exhibit 233 is what?

A Another Eastern White Pine from the chamber that we collected diseased branch material from the Pennsylvania source -- all right, and it shows again very severe short needle development in a couple of these twigs and some tip necrosis.

Q What do you mean by the Pennsylvania source?

A The plantation from which we collected the diseased branches that were placed in this chamber was located in Pennsylvania; in fact, it was near Hillsdale, Pennsylvania.

Q How far is that from the Mt. Storm area?

A A hundred miles, plus or minus 30.

Q And is this the same type of symptom you observed in the Mt. Storm area?

A It is similar to the symptoms I have observed on Eastern White Pines affected in the Mt. Storm area, as well as other areas.

Q All right, may we have the last slide?

A The next one should be a view of an Eastern White Pine from one of the check chambers.

MR. PETERSON: Exhibit 333.

HEARINGS EXAMINER: Have you got one more, Doctor?

WITNESS: That's it. That's a healthy White Pine, or a White Pine from the check chamber, no branch exposure, taken at the same time the preceding slides were taken.

MR. PETERSON: I believe there's one more. We're now looking at Applicants' Exhibit 334.

A This view is similar to one of the slides that we saw earlier. It shows a little more dramatically the point we were trying to make. This particular plant, a Scotch Pine, was exposed to infested branches during 1971. This is the 1971 growth. All right, these needles, the 1970 needles had been present at the time of the exposure in the branch exposure chamber. This particular seedling was placed in a chamber free of branches in 1972, when this growth developed. All right, the point is, there was tremendous premature defoliation and casting of the needles that had been affected during 1971. We see this kind of premature casting of needles associated with the problem in the field.

Q I believe that's all the exhibits.

MR. PETERSON: We'll offer Exhibits 321 through 334.

HEARINGS EXAMINER: Any objection?

MR. SHERIDAN: No, we'll offer 245 to 251, also.

HEARINGS EXAMINER: Very well, they'll all be admitted.

MR. PETERSON: I have an objection to 249 and 251 of the DNR on the ground that it has insufficient identification, Mr. Davis.

HEARINGS EXAMINER: Overruled. They're all admitted.

Q In the photographs that we saw of the healthy White or Scotch Pine, would any of them have been subjected to so-called transfer shock?

A No. These plants were potted several years prior to the initiation of the experiment, at least one. The seedlings from the check chamber and the seedlings from treatment chambers were handled in the same fashion through the off season, or through the dormant season. They were not removed from the pots between seasons. The pots were simply picked up and carried, in the case of the 1971 exposures series, from the cage area around the corner and to a location in Dr. Pennypacker's lawn.

Q Could the transfer to the outside be a shock?

A What do you mean, to the outside?

Q From the outside to the inside, could there be a transfer shock which would cause any difficulty?

A If you're talking about transfer of the seedlings from within the cages to outside the cages --

Q The other way around, I asked, outside in.

A It would be a sort of shock, like moving a plant from outdoors into a greenhouse, all right. We move them at about the time of bud break in the spring. In the fall, we move them out of the cages well before dormancy is set in in outside vegetation so that they would go into a normal kind of dormancy. The most important thing to keep in mind is that the check seedlings were handled in the same fashion as the treated plants.

Q Yet you found no difficulty with the check seedlings, as they grew?

A That is correct.

Q In your experience and your education as a plant pathologist, Dr. Wood, is it not often difficult to identify biological causes of disease?

A Often difficult, yes, and sometimes easy.

Q Do you usually use a process of elimination, more so than in going to the specific cause?

A Yes. In general, if you're looking at a disease -- or if one is examining or looking at a disease of unknown cause, there is generally a process of elimination that you use, that's right.

Q Dr. Wood, I'm handing you what has been marked as Applicants' Exhibit 355, sir, and I'll ask if you can identify it?

A It's a copy of my --

HEARINGS EXAMINER: I didn't hear you, sir.

A It's a copy of my biographical via.

Q And does it also include the publications with which you have been associated?

A Most of them, yes.

Q And does it include the list of people with whom you have done consulting work?

A I'll have to take a look. If it doesn't, I can supply that. It does.

Q And is it true and correct?

A With the exception of publications that I have been involved in in the last year or so. It's not a complete list.

MR. PETERSON: We'll offer Exhibit 335.

MR. SHERIDAN: I'd like to see it. (Examines exhibit.) No objection.

MR. PETERSON: We have nothing further.

HEARINGS EXAMINER: Mr. Sheridan?

Rebuttal, Re-cross, by Department of Natural Resources and Conservation

By Mr. Sheridan:

Q Doctor, would you name the diseases or the plant diseases which have unknown causal agents?

A All right. At the present time?

Q Sure.

A There's ash dieback, or ash decline.

Q Is that caused by a biological entity?

A It's not known. They suspect viruses; they also suspect soil factors.

Q Is that biological?

A It's physical, diseases of unknown cause. There's pit scab of potatoes, which is suspected of being a species of Streptomyces, but has not been proven. I think there is a disease called Silver Scurf of potatoes, which is believed to be caused by an element of the spore, Solani, but this is not proven. There is an array of annual canker diseases of hard woods, the causes of which are unknown. Examples -- black cherry, black birch, paper birch.

Q Any of those -- are any of those from biological entities?

A The causes at the present time are unknown. They're suspected to be fungi. At one time, I personally thought they were caused by Fusarium Solani, because similar cankers on such things as maple, sugar-maple, red maple, poplar, sweetgum, and so on, are caused by this particular fungus. There are also other fungi, such as Botryodiplodia, that cause these kinds of cankers, but on those species, to my knowledge today, and I haven't reviewed the literature on these in a year or two, at least, the cause is still not pinned down. It could be either way, but the suspects are fungi, in those cases.

Q Is it a fair statement, Doctor, that the majority of your consulting efforts for the past five years have been for power companies?

A Yes, in fact, the bulk -- if I may go on --

Q Sure.

A The bulk of my consulting with utilities has been involved in the establishment of baseline studies around three power plants in Pennsylvania. I've been involved in those studies since 1964, and I still am. They are the Keystone, Homer City, and Conemough power plants. They've all gone on line since about 1967, 1968. We have before and after data on those. That's been really the bulk of the consulting I've done until the Mt. Storm case came on.

Q About what percentage of your consulting activity is for an employer such as a power company?

A At the present time?

Q Oh, let's take the last five years.

A I'd have to say something in the order of 75% of it.

Q Have you ever seen the short-long needle syndrome in Missoula, Montana?

A I don't think I've ever been to Missoula.

Q Have you ever seen the short-long needle syndrome at Columbia Falls, Montana?

A I've never been to Columbia Falls.

Q Have you ever seen the short-long needle syndrome at The Dalles, Oregon?

A I've never been to The Dalles.

Q Same question for Ferndale and Bellingham, Washington?

A Never been there.

Q Clarington, Ohio?

A No, never been there.

Q Little Rock, Arkansas?

A I've been there, but way before the days of long needles, and short needles. By that, I meant before I got involved in this problem in 1969. I used to live not too far north of Little Rock.

Q On transplant shock, I just want to clarify this now. This can be induced by changing the planting site, whether from in the greenhouse to the outside or vice versa, can't it?

A It could be, yes.

Q Doctor, on that series of slides which you showed us, do you have a master list showing the date and the place the picture was taken?

A No. As I testified during my deposition I have a list of slides. I can identify them to study and to time of year, but in some instances, not specifically to date. In some, I can.

Q Do you have any pictures showing the overall pot and the entire seedling, showing the disease?

A I showed several in the cages. I have others that are a little bit closer views than those, where you can see the long-short needle disease in the terminal twigs. I don't think I have any closeups, because if one gets much closer, you either take the upper half or the lower half -- one or the other is going to be missing; would be missing.

Q Is there any way to tell that those pictures are not from the field?

A Well, in a sense, they were. They were taken in Dr. Pennypacker's backyard.

Q There's no way, then, other than your testimony here -- at least by way of a digest, or a record of those photographs, to determine whether or not those trees might as well even have been at Mt. Storm?

A Might even have been where?

Q At Mt. Storm.

A Oh, I have individuals who worked throughout the three years on the project that would testify to the effect of what I've said. Dr. Pennypacker has, under oath, in his deposition, to the effect that he saw me take the photographs, that he helped set the studies up, and so on. There's a Mr. John Coppolino, who works at the University of Minnesota, a Mr. Les Rieschel, a Mr. Richard Stevenson -- these folks were all involved in the study. I took graduate students of mine to look at these installations, and additional individuals at Penn State saw them on trips down to the Pennypacker farm, so I think I could bring together a fairly sizeable group of people that saw this study in progress.

Q But you don't have a list showing the date and the place the pictures were taken, do you?

A No.

MR. SHERIDAN: Nothing further.

Rebuttal, Re-redirect, by Applicants

By Mr. Peterson:

Q Were all of the photographs which were identified here in the exhibits that were taken in your study, taken by you or someone on your behalf in the study?

A The photographs of mine that have been shown at this hearing were all taken by me as a part of this study.

MR. PETERSON: That's all.

HEARINGS EXAMINER: There are no further questions. You are excused, sir.

(WITNESS EXCUSED.)

HEARINGS EXAMINER: Gentlemen, it is five minutes to five, and I would listen to what anyone has to say about how we're going to proceed, and then I can talk with my court reporter and see what she thinks about your plans.

MR. BELLINGHAM: We would, at this time, if possible, like to put on Robert Logan.

HEARINGS EXAMINER: Let me ask how much cross-examination do you anticipate with this witness?

MR. SHENKER: About 15 minutes. Mr. Peterson and I were negotiating on the timing question, and he assured me that if I could get Mr. Logan out for his plane, that he could get Dr. Ayres out for his plane.

HEARINGS EXAMINER: Are you going to examine Mr. Logan, Mr. Meloy? Is Mr. Graybill here? What time do you have to leave here to get on your planes?

MR. SHENKER: They're on the same flight.

HEARINGS EXAMINER: If Mr. Shenker and Mr. Graybill and Mr. Meloy want to stipulate to take 30 minutes on cross between you, we could work it out; otherwise, I don't think it will work.

MR. SHENKER: That's fine with me.

HEARINGS EXAMINER: Mr. Graybill, they've got two witnesses. The parties who are present said they would split the time on cross-examination.

MR. GRAYBILL: Who are they?

HEARINGS EXAMINER: Mr. Logan, for you folks to cross, and Dr. Ayres for their cross-examination.

MR. GRAYBILL: Well, I don't need Dr. Ayres, but I do need Mr. Logan, and because we haven't gotten two other witnesses that I wanted today, I'm going to stay over, so we might as well take Logan tomorrow morning, as far as I'm concerned.

HEARINGS EXAMINER: Under the order of procedure, I suppose I'd have to give priority to the case in chief--or to the rebuttal unless you could agree to some situation where you could work out the time factor. How much cross do you anticipate? Do you have any projection?

MR. GRAYBILL: I certainly have a half hour or 45 minutes, maybe more, of Logan. I don't have any of Ayres, I don't believe, but I do want to cross-examine Mr. Logan.

MR. SHENKER: Could I ask how long Mr. Peterson intends on cross-examination of Dr. Ayres?

MR. PETERSON: Well, not too long.

MR. GRAYBILL: I don't care what you do, but I don't want to be limited to half an hour on Mr. Logan after I've sat around all afternoon and there are two other witnesses that I wanted and neither one of them have been called. I am just not in a position to promise that I will only cross-examine Mr. Logan a half hour. I don't know yet.

HEARINGS EXAMINER: I can see what your situation is, and I think we'll have to recess until tomorrow, unless you can work out something that's agreeable.

MR. BELLINGHAM: I can see, as far as Mr. Logan is concerned, it's going to take well over an hour.

MR. GRAYBILL: Well, you might try by letting me start with Mr. Logan and then I'd see how far I could get and maybe I'd be through by a quarter to six.

HEARINGS EXAMINER: I'm concerned about Dr. Ayres, too, though. He's got this plane.

MR. GRAYBILL: That's my point. I don't think there are going to be very many questions of Dr. Ayres, but maybe I'm wrong.

MR. SHENKER: Well, let's give it a try if we can, Carl.

HEARINGS EXAMINER: I'm not going to schedule the witnesses so that they have to stand by, an expert witness, and pay him, unless it's 50-50, but if the Applicants are willing to go ahead with Dr. Ayres, I will; otherwise, we'll recess.

MR. GRAYBILL: My suggestion would be, if you want to get them both out of here tonight, we'll start with Mr. Logan. I may not take a half an hour. I don't know.

HEARINGS EXAMINER: Well, there are two others on your side, Leo, who have the right to cross-examine those witnesses.

MR. SHENKER: Let's give it a try.

MR. BELLINGHAM: That's fine with us.

HEARINGS EXAMINER: All right.

ROBERT K. LOGAN, called as a rebuttal witness by the Applicants, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

(THE WRITTEN DIRECT TESTIMONY OF MR. ROBERT K. LOGAN WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATEMENT OF TESTIMONY OF ROBERT K. LOGAN

Background.

I am self-employed in Tucson, Arizona, as a consultant in planning and public administration to government agencies and businesses. During the past year, some of my clients have been:

Pima County - City of Tucson, Arizona - April 1975 to present. Assisted in the application, work program development, and program implementation for a Regional Water Quality Management Planning program. This is a two year program funded by the U. S. Environmental Protection Agency for approximately $962,000.00.

State of Wyoming - July 1975 to present. Assisting in the implementation of the Wyoming Land Use Planning Act.

Assisting the State Planning Coordinator in developing means and methods for the state and federal agencies to assist communities impacted by energy resource development.

Assisting the Department of Environmental Quality in the developing of a Water Quality Mangement Planning program.

General assistance on federal, state and local government program relationships.

Mountain West Research, Inc., Denver, Colorado - August 1975 to present. Presently preparing "growth management" alternative techniques for Rosebud County, Montana. (Project was initiated in January, 1976.)

Assisted in the preparation of a proposal to Western Energy Company of "An Expansion Plan of Colstrip, Montana."

Assisted in the preparation of an environmental impact assessment for a highway project in Boise, Idaho.

Commission on Improved Governmental Management, Tucson, Arizona - June, July 1975. The commission is composed of 50 citizens investigating methods to improve the Tucson area local government. I assisted in commission reorganization and prepared a work program. I presently serve as an advisor to commission staff.

Other Experience.

Deputy Executive Director, Puget Sound Governmental Conference, Seattle, Washington - November 1974 to March 1975. The conference is the regional land use and transportation planning agency for the Seattle, Tacoma and Everett metropolitan areas.

Assistant for Local Government Relations to Governor.

(Administrator, Local Government Relations Division)

State of Oregon, August 1968 - November 1974. Major responsibilities and activities:

Served as a member of the staff of Governor Tom McCall.

Assisted cities and counties in strengthening management and problem solving capabilities.

Provided planning and zoning technical assistance to local governments.

Served as the State A-95 Clearing House and State Planning Agency for federal environmental impact statements and federal program coordination.

Administered HUD "701" planning and management grants of about $1.5 million annually for cities, counties, state agencies, councils of governments and Indian reservations.

Co-authored the Oregon Land Use Planning and Subdivision Legislation in 1973.

Organized the "Eight Western States Conference on Balanced Growth" in 1972.

Organized the Oregon Coastal Zone Management Agency. Developed and provided assistance to regional local government planning agencies.

City of Tigard, Oregon - October 1965 - August 1968. First City Administrator of Tigard, a suburb of Portland. The city incorporated in 1961 and population grew from 1,844 in 1965 to about 6,300 in 1968. The assessed valuation grew from $12 million in 1965 to about $65 million in 1968.

City of Tucson, Arizona. Assistant to City Manager - March 1965 to October 1965; Annexation Director - October 1964 to March 1965 (annexed about 13,000 new residents to the city); Assistant to Finance Director - May 1964 to October 1964; Administrative Intern - August 1963 to May 1964.

Education.

University of Arizona, Bachelor of Science degree, Public Administration, 1963; University of Arizona, completion of course work for Master of Public Administration, 1963-1964.

I have written or been responsible for several publications on planning, compensable zoning, federal programs and local government modernation. I have also participated as a speaker at many professional and citizen conferences.

Field Trips to Rosebud County.

A field trip was made to Rosebud County on March 5, 1976. During that trip I met with Eldon Rice, Rosebud County Planning Coordinator, at Forsyth. I also met with Martin White of Western Energy at Colstrip for a tour of the community, facilities and a review of the Colstrip plans.

Research.

I have reviewed Montana's Local Planning Legislation, prepared in October, 1975, by the Montana Department of Community Affairs, the Ken R. White plan for Colstrip, and the Wirth & Associates and Christian, Spring, Sielbach & Associates plans for Colstrip. Extensive discussions about Rosebud County have been conducted with employees of Wirth & Associates, Mt. West Research, Inc. personnel, and Cal Cumin, Planner for Rosebud County.

Growth Management.

In previous testimony presented on behalf of the State of Montana, Department of Natural Resources, concerning the construction of Colstrip Units 3 and 4, major attention was focused upon the lack of state growth policies, a state land use planning process, and a Rosebud County comprehensive land use plan. The conclusions strongly suggested that the unavailability of these policies and plans would stimulate abuses to orderly community development. The testimony neglects to mention actions taken by the state, Rosebud County, and Western Energy Company to deal with growth and development and, further, fails to mention steps taken to mitigate impacts associated with the development of Colstrip Units 1 and 2.

There are no ready-made answers to issues of growth and development. In most cases the plan has been used as a method to get all the facts assembled for the decision makers, but in others the plan has been viewed as the end product - a panacea to all community growth problems. Often the planning process has been avoided by state and local government until problems reach crisis proportion. For example, voters in California reacted to wall-to-wall coastal development by enacting through initiative, stringent requirements to plan and safeguard the coastal area; Vermont adopted land use planning after a major influx of new residents and recreational developments threatened to damage the environment; Hawaii had much the same situation and the impetus in Florida was critical danger to the water resources by placement of new developments.

A few years ago there probably wasn't too much motivation to plan the state of Montana or its communities. Population was not growing too fast and some of the counties were probably losing people. The same was true for Wyoming. There the population grew by only 2,000 from 1960 to 1970 and 17 of the 23 counties actually lost population. Many of the rural communities were in the doldrums; jobs were scarce for the young; and services, medical, dental and shopping seemed to be getting further and further away. The situation has now changed with energy development. About 50,000 new residents have entered Wyoming since 1970, and there is activity, opportunity, problems and the need to plan.

Montana appears to be similar to Wyoming in many ways; the people are independent, and until recently haven't had to deal with problems of population or community growth. Planning, zoning and building codes are new and prompt questions of why do we need to be regulated. The tendency is often to want to regulate the other guy. Some want to move too fast and adopt more governmental regulations - often without recognizing the ability of laws already enacted and available. Some feel that preparation of a plan or zoning will cure all the problems. A plan is certainly a major part of the answer and will provide a blueprint and framework for community or state decisions, but the real key is getting citizens to recognize the issues and opportunities. This recognition doesn't happen overnight and the traditions and ways of government doing business doesn't adapt as quickly as some may want. In some states, local government officials have gotten too far ahead of citizens and have been recalled from office for adopting planning, zoning, or building codes. The best approach is to build a solid base of understanding and community support, rather than rush into a crash program that nobody understands or wants.

Feedback from ten Governor's Land Use Workshops conducted in Wyoming in November and December, 1975, indicates the citizenry of that state wants planning and growth management but with a maximum of local control and an avoidance of interference, as much as possible, from state or federal levels.

Growth Management Tools Available.

Ample authority exists for local government in Montana to develop aggressive growth management controls.

The State of Montana has an important growth management tool available to local government not mentioned in previous testimony, the Montana Subdivision and Platting Act (Sections 11-3859, et seq., Revised Codes of Montana, 1947). This law requires each county and city to enact a subdivision law and requires the state Department of Community Affairs to establish minimum standards for all local governments to meet. The law is very comprehensive and provides local governments with a positive growth management tool unavailable in most other western states. It requires a subdivision process for divisions of land into one or more parcels of 20 acres or less. Most other states have a limit, usually of four lots, and this has led to major abuses in community development. The law is applicable to residential, commercial and industrial subdivisions. The law also requires the submission of an environmental assessment by the subdivider to the local governing body. If a master plan has been adopted by a local government an exemption may be given if the subdivision is in conformance with the plan. The environmental assessment must include (Subsection (4) of Section 11-3863, Revised Codes of Montana, 1947):

> "(a) a description of every body or stream of surface water as may be affected by the proposed subdivision, together with available ground water information, and a description of the topography, vegetation and wildlife use within the area of the proposed subdivision;
>
> "(b) maps and tables showing soil types in the several parts of the proposed subdivision, and their suitability for any proposed developments in those several parts;
>
> "(c) a community impact report containing a statement of anticipated needs of the proposed subdivision for local services, including education and busing, roads and maintenance, water, sewage, and solid waste facilities, and fire and police protection;
>
> "(d) such additional relevant and reasonable information as may be required by the department through its division of planning."

The environmental assessment, in essence, requires a planning process by local governments for each subdivision. To a large extent the items required are the same elements typically found in a local government plan.

The Montana Subdivision and Platting Act has a unique feature which requires disapproval by a local governing body of any subdivision which it finds not to be in the public interest (Subsection (4) of Section 11-3866, Revised Codes of Montana, 1947). Furthermore, in order to determine whether a proposed subdivision is in the public interest, the Montana Subdivision and Platting Act provides that the governing body shall issue written findings of fact which weigh the following criteria for public interest (Subsection (4) of Section 11-3866, Revised Codes of Montana, 1947):

"(a) the basis of the need for the subdivision;

"(b) expressed public opinion;

"(c) effects on agriculture;

"(d) effects on local services;

"(e) effects on taxation;

"(f) effects on the natural environment;

"(g) effects on wildlife and wildlife habitat, and

"(h) effects on the public health and safety."

Through use of the Montana Subdivision and Platting Act and the State Planning & Zoning Statutes, local governments have ample authority and opportunity to prevent undesirable development. These tools are the equal or better than most western states.

Capability of Local Government to Respond.

In Rosebud County some major steps in growth management have already been initiated. An interim growth management system is presently being worked on by the County Planning Board and steps are being taken toward the preparation of a county comprehensive plan. Mr. Cal Cumin of Cumin Associates will be presenting additional information and material on Rosebud County planning and programs.

Many of the same growth pressures of rapid growth being experienced by Rosebud County are now being felt in other states. Some innovative solutions to the problems facing local communities have been developed in Montana and Wyoming. The coal impact tax fund in Montana and Community Development Authority in Wyoming will provide communities revenues for providing public facilities to new residents. There are still some unanswered needs for communities, such as front-end funds for operational expenses for public services, and mortgage monies for private home construction. Programs are being considered in Congress to provide relief to these problems, but the challenge will be in developing a coordinated response of government agencies offering assistance to counties like Rosebud.

Rosebud County has experienced a major increase in its ability to provide local funds for public services by addition of Colstrip Units 1 and 2 to the tax base. If Units 3 and 4 are constructed, the tax base will be further increased.

Rosebud County and the community of Colstrip appear to have handled the influx of new residents to the area by the construction of Colstrip Units 1 and 2 in a very adequate manner. In my opinion the community of Forsyth didn't have the appearance of a "boom town", and presented the image of an active rural trade center. The community of Colstrip showed effects of recent residential, commercial and industrial construction activity, but didn't have a slam-bang, jerry-built appearance.

Role of State Government.

Several of Montana communities are or may be encountering strong developmental pressures. Most of the communities affected have a rural orientation and, up until now, there has been little, if any, pressure to add governmental services or facilities.

The problems of rapid population growth stretch far beyond the resources and abilities of local governments. The coal impact tax is most certainly an important step in mitigating the problems associated with growth. No level of government or private company, though, can do it alone and therefore it requires a coordinated effort on the part of the public and private sector.

Local governments may find it difficult to face pressures of development but will be strengthened if state government and private companies stand with it.

A multitude of federal, multi-state and state agencies are now considering programs for impacted areas like Rosebud County and offers of assistance could become a tangled thicket of overlap and duplication. State government is in an important position to serve as the facilitator and coordinator of assistance programs for impacted communities.

Planning for Colstrip.

Previous testimony presented on behalf of the Montana Department of Natural Resources criticized the plan prepared by the Ken R. White Company for Colstrip. The plan was termed inadequate because: (1) the plan is a layout for a company town, (2) dull and unimaginative, and (3) inadequate area set aside for residential, commercial, and recreational developments.

The plan prepared by the Ken R. White Company was for a company town, owned and operated by the Western Energy Company. In the preamble to the plan a statement is made:

> "The operative rationale for the plan assumes the Western Energy desires guidelines that will assure orderly, compact, efficient and economical development. The rationale, also assumes that within reasonable economic bounds, Western Energy desires to develop a community that will appeal to residents and visitors both from functional and aesthetic standpoints."

From my review of the document, its purpose was to serve as a framework for Colstrip's development and not a detailed plan. Considering the cost of the study paid by Western Energy, the Ken R. White plan was a good document. The more detailed plan prepared by Wirth & Associates and Christian, Spring, Sielbach & Associates used the Ken R. White plan as a basis for engineering, architectural and landscape design.

Personally, I did not find the community to be dull and unimaginative, but rather well constructed and appealing for the purpose of its use. I also observed what I consider adequate lands available for expansion of the town and recreational facilities.

There appears to be some positive results from the planning in Colstrip. Residents of the community have found the town and their accommodations suitable enough that they are interested in purchasing homes and lots; employees of nearby mining operations have expressed interest in buying real estate and living in Colstrip; and private developers and merchants are interested in acquiring land or facilities in Colstrip for use.

The planning efforts at Colstrip, in concert with Rosebud

County, has made the area eligible for federal community grant programs. The U. S. Bureau of Outdoor Recreation, for example, has participated in the development of a park and open space system.

Conclusions.

The State of Montana has adequate laws available for Rosebud County to plan for orderly development, and to prevent undesirable growth from occurring within the county.

Rosebud County officials are aware of the need to prepare growth management policies, plans and implementation actions, and are taking steps in this direction.

Western Energy Company officials are cooperating with Rosebud County in planning efforts.

The community of Colstrip is a well-planned single industry community. Services and facilities are presently available or planned on a par to communities of equal or greater size.

EXAMINATION OF ROBERT K. LOGAN

Rebuttal, Cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Mr. Logan, are you a member of any professional society, sir?

A Yes, sir, I am a member of the International Managers Association.

Q Are you a member of the American Institute of Planners?

A No.

Q Are you an associate member of the American Institute of Planners?

A No.

Q Are you an affiliate member of the American Institute of Planners?

A No, I never chose to join either one of those groups.

Q In your statement on page 1, you refer to a study in Pima County in the city of Tucson, Arizona, a two-year program. Has it started yet?

A Yes.

Q When did it start?

A They hired staff approximately in January. They have resubmitted the work program to EPA and they're tentatively underway. The money has been released by EPA.

Q On the same page, at line 23, you describe a preparation of a growth management alternative techniques program for Rosebud County, Montana. Who is your client?

A I'm working for Mountain West Research, Inc., out of Denver, which is affiliated with Cal Cumin and Associates, who is the planner for Rosebud County.

Q Then on the next line, you refer to the preparation of a proposal to the Western Energy Company of an expansion plan of Colstrip, Montana. Was that a bid proposal?

A We were requested by Western Energy Corporation. It was Ted Wirth and Associates and Mountain West Research of Denver, who prepared the proposal.

Q And you worked with Mountain West Research on the preparation of the proposal?

A I'm affiliated with Mountain West.

Q Has it been accepted yet?

A No.

Q When was it submitted?

A I believe it was September.

Q 1975?

A 1975. I spent two days in Billings.

Q For what kind of expansion was the proposal made?

A The proposal was made to look at Colstrip and its development and look at alternative ways of dealing with the community problems and community growth issues. It involved looking at the alternatives -- the proposal looked at alternatives of different types of local government managership for the particular community; in other words, should they incorporate, should they incorporate as a city, should they be a special district, what are the alternatives that are on the table.

Q Oh, I see. It wasn't a proposal to try and take a look at all of the possible impacts of Colstrip 3 and 4 on the area?

A No. It was more a managerial type of proposal, in terms of what are their options as a company.

Q What form of government should they propose for their succession?

A Yes, and what are the financial implications, both in terms of bonding, federal programs, et cetera.

Q Next in your statement, Mr. Logan, you refer to assisting in the preparation of an environmental impact assessment for a highway project in Boise, Idaho. Who was your client?

A My client was again Mountain West, and their client was the Ada County Highway District, and it was the Boise River crossing.

Q In your description of your experience, sir, on page 2, you note that you were the Deputy Executive Director of the Puget Sound Governmental Conference in Seattle for a period of four months.

A Yes.

Q Why did you leave?

A I was unhappy with the job and I didn't like the climate of Seattle.

Q The Director of the Puget Sound Governmental Conference is Mort Cask, is it not?

A Yes.

Q He asked you to leave, did he not?

A No.

Q That group is breaking up now, is it not?

A Yes. I think that the issue on that, however, was that I decided I wanted to leave that particular agency.

Q In your description of your experience in the state of Oregon, for a period of some six years, you state at page 2 of your testimony, line 25, that you were a co-author of the Oregon Land Use Planning and Subdivision Legislation in 1973.

A Yes.

Q Were you a member of the legislature then, sir?

A No, I wasn't. I worked very closely with Senator Hector McPherson, of Linn County, and I think in the accounts of who worked and put together the legislation, you'll find that Hector and I were given credit for writing it.

Q Do you think L. B. Day would agree with that?

A I'm sure L. B. wouldn't agree with a whole lot.

Q Including that statement.

A L. B. did not work on the development of the legislation. L. B. worked on the legislation once it reached the legislature.

Q Who is L. B. Day?

A L. B. Day is the Chairman of the Land Conservation and Development Commission of the state of Oregon.

Q Then, in the next line of your statement, Mr. Logan, you describe having organized the eight Western States' Conference on balanced growth in 1972.

A Yes.

Q Whom did you contract out the consultative role for the planning, management, and reporting.

A This was a project that the state of Oregon co-sponsored with the Department of HUD and they gave us the money to do that. We hired the firm of Dim Jim -- and Mr. Arnold Cogan was the project coordinator for the project.

Q Dim Jim being Daniel, Mann, Johnson, and Mendenhall, of which Mr. Cogan was the chief planner?

A Right.

Q On page 3 of your statement, Mr. Logan, at line 22, you note that you made a field trip to Rosebud County on March 5, 1976. Your first visit there, sir?

A First visit.

Q Only visit there?

A Yes.

Q I asked you that because Mr. Bellingham seemed awfully concerned about the fact that Mr. Cogan had made only two field trips into Montana.

A I think the backup to that, however, is that I did spend two days in Billings going over in detail quite a few of the maps and charts and pictures of the Colstrip area, and I felt familiar with the area.

Q You spent adequate time, in your view, did you not?

A In my judgment, I did, for my comments.

Q Will you turn to page 6 of your statement, please, Mr. Logan? At line 18, you describe some growth management tools which are available. Were you here in the room when Mr. Cumin was testifying earlier today?

A Yes.

Q And of course you've met with Mr. Cumin previously, haven't you, sir?

A I've met him quite a few times.

Q And you knew about the work that he was engaged in, and do you think he correctly described it as you understood it today?

A Yes.

Q And as you understand it, then, Mr. Logan, you realize, do you not, that these tools are being developed now with the assistance of Mr. Cumin for Rosebud County without a currently existing overall comprehensive plan? You understand that, don't you?

A I'm confused, frankly, and I don't mean to prolong the testimony, but I'm confused by what you mean as a plan. Do you mean the plan that is defined in the Montana statutes? There is a definition of a master plan in the statutes. Is that what you mean?

Q That wouldn't be a bad start. Do you know what that is?

A Yes, I do. I've read it.

Q Do you think such a plan exists?

A No, except that I think -- the reason I raised the question is that -- and I realize quite a bit of comment was made on that particular point -- and I was concerned that, No. 1, what is a plan, and what you expect that plan to be, and that is, I think the point that Mr. Cumin was trying to get across was that the state of the art in planning has changed from a product-oriented book that sets out a definite map type of situation or a list of charts, et cetera, to more of a process whereby it becomes a management tool for a city council, a mayor and county commissioners, or who wants to make decisions. It's not something that's static, and so when you talk about a plan being developed for Rosebud County, I think it's misleading. I think the point I'd like to state is that that subdivision act, which is also stated in this testimony on that same group is a part of that planning process.

Q Yes, I understand. I appreciate your introducing the term, process, for us, in your testimony, sir. There's been previous testimony on that. The planning process, as you would understand it, Mr. Logan, is very much like the process by which, for example, a Rembrandt paints a painting, the result of which we eventually see when he's done, isn't that correct?

A I would characterize it more like an accountant developing a set of books; in other words, he maintains a systemized and a systematic way of looking at the records of a county or a company and analyzing its point in time. The plan, I think, is a snapshot at a particular point in time that speaks to where you're at, so I think that as part of that, it becomes a guideline or a guidance.

Q And hopefully, it should tell you where it's going to go, right?

A Yes, but getting there and deciding where to go is not that finite a process that you say, I want to be there. The other point that I think has to be considered is that there are levels of planning, and that is, that the local government only has responsibility and jurisdiction up to a particular point, and then you have state, you have regional, you have federal.

Q Good, I'm glad you introduced those, also, and they're all part of the process, and they're all important, aren't they?

A Yes, right.

Q Now, on page 9 of your statement, Mr. Logan, line 8, you state and I'm sure we would all agree -- it seems to be the uncontraverted testimony in this case -- that there are still some unanswered needs for communities. Do you have a proposal, sir, for the meeting of those needs?

A In responding to line 8?

Q Yes.

A I made a mistake in that particular point. I found some information later on that I didn't realize was available. There is a law passed in 1975 by the Montana legislature, which allows for funding moneys of this type to be made available to impact communities. All they need to do is just ask for it once an industry of more than a hundred employees is located within that particular jurisdiction.

Q But alas, it doesn't apply to power plants, does it, Mr. Logan?

A According to the Division of Planning of the Department of Community Affairs, it does. -- excuse me, not planning -- it applies to facilities once a decision is made for a particular industrial site.

Q They have to be new facilities, don't they, Mr. Logan?

A Yes.

Q You've heard of the Montana Power Company's corollary to the new facilities rule?

A No.

Q There was some testimony on that last week. The Montana Power Company has already established that it doesn't constitute a new facility.

A Colstrip 3 and 4?

Q Right.

A I was not aware of that.

Q I see. Now, on page 9, also, of your statement, sir, you refer to the manner in which the problems of Colstrip 1 and 2 may or may not have been met. You would agree with me, would you not, Mr. Logan, that the manner in which those problems were met, was a reactive one?

A I think almost all questions of growth and development in any community are reactive.

Q Unless you plan for them in advance.

A Yes. One of the -- you can't plan for loss in a community; in other words, if you take a community and you project that that community is going to lose -- take Juntura, which is in Oregon -- how do you plan for a Juntura, which may be losing a population, and the tool of planning and growth and development management is applicable to a growth situation, and I think in that regard, it is reactive.

Q You understand the planning process not to anticipate problems but only to react to them?

A I think most planning is initiated after a problem is identified, either potential or in being.

Q Have you read the Montana Utility Siting Act, Mr. Logan?

A No, I haven't, sir.

Q In the conclusion of your statement, sir, on page 12, you tell us of the fact that Western Energy Company officials are cooperating with Rosebud County in planning efforts. Is that the word that you get from Cal Cumin or some other source?

A No, that was in a conversation with both Eldon Rice, who is the County Planning Coordinator and in discussions with Martin

White, as to what their role has been in the area.

Q Also, in your conclusion, sir, at line 10, you describe the knowledge of Rosebud County officials that there is a need to prepare growth management policies, plans, implementation of those plans, and steps have to be taken in that direction. You would regard the work that Mr. Cumin described in his testimony, both in his prepared statement and cross-examination today, as part of the necessary work that has to be done yet, wouldn't you?

A I would regard the work that Mr. Cumin is embarking on now as a part of the growth management tools that are needed in Rosebud County.

Q That is to say, that is necessary work, is it not?

A I think the question again goes back to the availability of the Montana Subdivision Act. It is not a typical subdivision act that most states have, and I say not typical, because it requires some type of an analysis on lots split into one or more parcels, where this is not the rule in most other states. They usually deal with more lots and don't get into this type of situation.

Q You understand that that work hasn't been done yet, don't you?

A Yes, it has.

Q You believe that all of the analyses have been made and all the subdivision preparations and all the environmental assessments?

A No, what I'm saying is that when a person comes in with a proposal and it involves the cutting up of a parcel of ground into one lot or more, then that subdivision process, which requires an environmental assessment, which requires findings, has to be embarked upon.

Q But that hasn't been done yet, has it?

A It has been done on any proposal that's been brought in since they adopted their subdivision, so it is available right now as a tool.

Q Ah, yes, the legislation is on the books --

A No, the legislation is on the books both at the state and at the Rosebud County level.

Q Yes, but it hasn't been implemented yet for Colstrip 3 and 4, has it?

A This does not apply to Colstrip 3 and 4. We're talking about the impacts that would be associated with Colstrip 3 and 4.

Q Yes, sir, and that hasn't been done yet, has it?

A There have been no impacts that can be traced to 3 and 4 that I can pinpoint.

Q I see, so therefore, there would be no necessity for doing the planning yet, is that your view?

A I didn't follow that.

Q You say there have been no impacts that have been traced to Colstrip 3 and 4 yet, and I'm wondering as a result of that view whether it was then your view that there is no necessity for doing any planning yet?

A No, I agree that there is a need for planning, but the tools are there. One of the parts of planning, I think, that has to be thought about is that you have to have a base or a starting point, and the Montana Subdivision statutes plus the Rosebud County subdivision statute gives you that basepoint from which to start the planning process. I think the planning process is absolutely necessary. I think the outline that's been developed by Cumin and Associates is right on target as a community plan. It's much broader, in fact, than the statutory definition of what is allowed under a city and county planning program, as to plan.

Q You wouldn't disagree with Mr. Cumin, would you, that the charts in his outline for planning purposes, have not yet been completed? You understand that, don't you?

A But again --

Q Do you understand that?

A I understand that, but I'd like to just clarify it, and that is that the planning is never completed, and I think that that is the error. If you were looking for a product, then it's a mistake to even start it. The thing is, to look for a process in which the local citizens, the elected officials, can arrive at some of these decisions.

Q Well, there comes a time in the planning process, Mr. Logan, when folks say, okay, we have now sufficiently utilized the tools that are available to us that we can evaluate, what the impact of a particular course of action is, what our alternatives are, and how we would resolve any problems that are presented to us. That's part of the process, isn't it?

A Yes.

Q And that hasn't happened yet in connection with Colstrip 3 and 4, has it?

A I would disagree. By who?

Q By anyone.

A I can't speak to that question. If you're trying to say that Rosebud County hasn't done it or whether this hearing process hasn't done it, I don't feel qualified, but I'm not sure that when you expand that notion and include the planning process, the Subdivision Planning Act of Montana is a planning process. It may be a functional plan and it may be a smaller than total plan, but it is a plan.

Q I understand that, Mr. Logan. You're not trying to say that the process and the plan, utilizing the subdivision laws or any other laws, have progressed to the point where any of us sitting here today can say, good, we now know how we can resolve whatever issues are going to be presented by whatever growth development is to be associated with Colstrip 3 and 4? None of us can say that today, can we?

A I'd say we can to a pretty good degree.

Q On what?

A One weakness that is not covered in controling undesired growth right now are those parcels of ground that were previously divided; in other words, if you take a particular piece of ground right now, without a plan, without zoning, virtually any development can happen on that particular piece of ground. Now, if the lot is subdivided, you'll find by reading the findings that are required in the Subdivision Act that in essence, you evaluate what that development is going to be before it is allowed to proceed.

Q But that hasn't happened yet, has it, Mr. Logan?

A They have enacted a subdivision law which can protect against development associated with Colstrip 3 and 4.

Q One of us is being obtuse.

A I don't mean to be. I apologize if I am.

MR. BELLINGHAM: Why don't you admit that Mr. Shenker is being obtuse? I'm being facetious.

Q Let's see if we can't simplify it, Mr. Logan. You will agree with me, will you not, that nobody has said, any planner anywhere, "Here, use your subdivision law tools and conduct an assessment in order to determine what the impacts will be of any proposed development which would be associated with Colstrip 3 and 4." You'll agree with that, won't you, sir?

A Could I state this? There is no community plan in the broadest concept, as far as any development that would be associated with Colstrip 3 and 4. There is a tool if the property is subdivided and falls under the statute, there is a tool available to analyze the impacts and deny the request if the impacts are negative.

Q Has that been done, Mr. Logan?

A It has been done at Rosebud County because they have enacted a subdivision law.

Q Oh, come on, Mr. Logan, listen -- either somebody has presented to the planners or has not presented to the planners a request for their use of the subdivision law. Now, has that been done?

A Now, if you're asking me, has that subdivision law been utilized by Rosebud County, I don't know.

Q Do you have a suspicion that it's been used?

A I suspect it probably has, knowing Cal Cumins, because any development now falls under that after it was enacted. I was present when he told Martin White that they wanted to come in contact with Burtco on the trailer park and it had to follow the subdivision ordinance.

Q Well, as a matter of fact, you know, don't you, Mr. Logan, from Cal Cumin and his testimony here today, that that law has not yet been applied?

A In all honesty, Mr. Shenker, and I'm not trying to be obtuse, I did not get that meaning from Cal's testimony.

Q Well, do you know, Mr. Logan, whether that law has been applied in any manner in connection with Colstrip 3 and 4?

A I do not know.

MR. SHENKER: All right, nothing further.

HEARINGS EXAMINER: Mr. Meloy.

Rebuttal, Cross, by Northern Cheyenne Tribe, Inc.

By Mr. Meloy:

Q Mr. Logan, on the first page of your statement, you say that you're presently assisting in the implementation of the Wyoming Land Use Planning Act. Would you very briefly describe what that act is?

A This is a law that was passed by the 1975 Wyoming legislature which mandates that all cities and counties in the state shall enact a land use plan. It provides for a 9-member commission, which is appointed by the Governor, which establishes statewide goals, guidelines, and policies in which, then, the local governments have to follow.

Q Do you know that Montana has a similar act?

A Montana has an act -- I don't know the number of it -- it was introduced by -- and I saw the author's name -- I've read the bill, by Mr. Fagg, that relates to comprehensive planning. It appears that in one section of that act it demands local government to prepare a land use plan. Now, the law does get quite confusing as it gets into its economic relationships, but for purposes of the land use law, it does require local government to develop land use plans.

Q Does it mandate planning in the counties in the same context that the Wyoming Land Use Planning Act mandates planning in the county?

A It does not follow the Wyoming Land Use Planning Act.

Q Does it provide a process for identifying critical areas?

A Not that I know of.

Q The Wyoming Act?

A The Wyoming Act does provide a process for identifying critical areas.

Q So your answer to the question you thought I was asking was that Montana doesn't have a similar process?

A That Montana does have a land use planning act -- not all state land use planning acts require identification of critical areas or areas of more than local concern.

Q Right, but my question is, does Montana have one of those kinds of acts like Wyoming does?

A Montana does not have an act like Wyoming.

Q When you were in Rosebud County, did you talk with anyone else other than Eldon Rice and Martin White?

A Not specifically, no. In generalities, we talked with a few people, but those are the two people we discussed with about the area.

Q Do you know where the Northern Cheyenne Reservation is?

A Yes, I went down there.

Q What county is it in?

A It's in Rosebud County, as I understand it, south of Colstrip. We went back through Colstrip to Lame Deer and then back to Hardin, and then we made a stop there to see some people on the reservation.

Q Whom did you see?

A Cal was trying to see -- I think it was Rowland. Is that his name?

Q Whom did you see?

A On the Indian reservation?

Q Yes.

A He stopped to see this individual.

Q Whom did you see?

A I didn't see anybody. I saw people there, but I didn't talk with people.

Q You had extensive discussions about Rosebud County with employees of Wirth and Associates, Mountain West Research, Inc. personnel and Cal Cumin, but you didn't have any extensive discussion about Rosebud County with any Northern Cheyennes, is that right?

A No.

Q On page 5 of your statement, you have a series of statements comparing Montana and Wyoming, the first of which, says: "A few years ago there probably wasn't too much motivation to plan the state of Montana or its communities." How do you know that?

A I think that the similarities in the terms of the growth phenomena that have occurred in both states -- for example, Montana has lost population from 1960 to 1970 in 39 out of 56 counties, and this is similar in the sense of a rural population loss that has been a phenomena in both states. My point is that these rural communities have lost population, and it's been a steadily decreasing type of situation.

Q And that's the basis for your statement that there probably wasn't too much motivation to plan in the state of Montana?

A Most of the motivation for planning has come with growth. Virtually every rural area is suspicious of planning and suspicious of zoning until there is growth or some type of stimulus there to prod them into action.

Q How many years back are you talking about?

A In what?

Q Your statement -- I'm wondering how many years ago there probably wasn't too much motivation to plan in the state of Montana?

A From the figures I've seen, probably up until about 1970, and then the population seems to have turned around in both states. Since 1970, from the figures I received from the Department of Community Affairs, the state of Montana has grown about 40,000 and Wyoming has grown about 50,000 in that same period. The six counties that are covered by this Westmoreland study indicate that there's been a growth factor in most of those counties during that same period.

Q So the basis for your comparison of the two states is limited to your population studies, is that right?

A It's population, and I think some of the same phenomena, and that is, I think, the energy development. It's energy-oriented.

Q On page 6 of your statement, you say, as you're talking about planning and its regulation, "the real key is getting citizens to recognize the issues and the opportunities." What mechanism is there in Montana that gets citizens to recognize the issues and opportunities?

A In Montana?

Q Yes.

A Of course you have that one bill, the Fagg Bill, which does require the development of a plan. I'm not sure it speaks to citizen involvement, but it does require a plan. You don't have a formalized citizen participation process that I know of.

Q Then how do we solve that problem in Montana?

A I don't have the answer for Montana, sir. I would point out that the state of Wyoming does not have a mandatory citizen participation process, either, but they've gone out and involved the people.

Q On page 9 of your statement, you say that "the coal impact tax fund in Montana will provide community revenues for providing public facilities to new residents." Did anybody tell you that there were new residents on the Northern Cheyenne Reservation by virtue of the development in the area surrounding the reservation?

A I was confused by that in this Westmoreland study, to be quite honest with you. As I say, from 1960 to 1970, there was a large population growth in Ashland, which I notice on the map, is adjacent to the reservation, or a part of it, and then there was a very big jump on the reservation from '60 to '70, and there's been virtually no gain between '70 and '74 that I could see in this Westmoreland study, so the data I've seen indicates that there has not been a jump in population from '70 to '74, but rather, the jump on the reservation was from '60 to '70, and the only reason that I'm raising that is that I'm confused, and I don't know how to answer your question, but I think it's an important issue, but there may have already been impacts on the reservation. I noted in this study that there was an industry with 140 employees in Ashland, so there have already been some impacts that perhaps can't be traced to the coal development.

Q You didn't notice any trailer courts on the reservation on your way down through Lame Deer, did you?

A I really don't recall just how much -- I noticed a lot of new HUD housing. I guess that's what attracted my attention more than the trailers.

Q Did you go down during the daytime?

A It was in the daytime.

Q Did you talk to anybody there about the new residents in Lame Deer?

A I didn't talk to anybody on the reservation about this issue.

Q What coal impact tax fund moneys are available to the reservation to help them provide the public facilities to new residents?

A I heard you ask the question of Mr. Cumin, and I don't know what the law allows, but I understand that there was an application and that it was turned down, so I don't know what there is available.

Q Well, you make the statement that this coal impact tax money is available, and I'm just trying to narrow down to whom it might be available.

A I basically said to Rosebud County, but as you know, various state laws have different interpretations as to authority on regulation on Indian reservations. For example, Arizona allows the state -- or there is a law that states that the state may regulate on reservations, so they've got a broader interpretation. Other states have stayed off.

Q I'm not asking you a question about regulation on the reservation. I'm asking you whether or not you know coal impact tax money is available to the Northern Cheyenne Reservation?

A The reason I was saying regulation, is that regulation usually then transfers into receipt of funds.

Q Did you answer my question?

A I don't know whether it is.

Q My question, again, is, does coal impact tax money go to the Northern Cheyenne Reservation?

A I have no idea, Mr. Meloy.

Q Does it go to the city of Forsyth?

A From what I understand, they are an eligible applicant.

Q How about the city of Colstrip?

A I'd say the community of Colstrip.

Q Yes?

A Yes.

Q But you're not sure about the Northern Cheyenne Reservation?

A I'm not sure of the legal status, as to whether it's an impacted area or whether it's eligible.

Q Do you think the coal impact tax is an important step in mitigating the problems associated with growth?

A I sure do.

Q Do you think that money should go to the Northern Cheyenne Reservation?

A I think that would be a perfectly logical way to use the money.

Q But you don't know whether it can or not?

A I have no idea, sir.

Q Would it surprise you to know that it can't?

A I heard your comment earlier, and I was surprised.

MR. MELOY: I have no other questions, Mr. Davis.

HEARINGS EXAMINER: Mr. Graybill.

Rebuttal, Cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Logan, I take it that you're a planning consultant, from your statement, and that you've been hired for this job, is that right?

A Yes.

Q Who is your employer again?

A Which job? The present job that I'm working on right today or the job that I'm working on in Rosebud County?

Q Well, let's talk about the one today.

A Today I'm working for Montana Power.

Q You were hired by them to come here and prepare this statement?

A Yes, sir, I was.

Q What about the job in Rosebud County?

A By Mountain West Research, Inc., out of Denver, and they are working for Cal Cumin and Associates, out of Billings.

Q So you're an employee of the group that's working for Mr. Cumin?

A I'm an affiliate with them.

Q Now, I see on page 3 that you took this field trip to Rosebud County on March 5th of this year. That's about 25 days ago?

A Right.

Q And I understand from your cross-examination by Mr. Meloy that you didn't talk to any Indians while you were down there?

A No, sir.

Q What ranchers did you talk to?

A I didn't talk to any ranchers.

Q What residents, old-time miners, did you talk to?

A I didn't talk to any old-time residents or ranchers.

Q You only talked to two people, as I understand it?

A That's correct. I think you'll find in my testimony that I

Q did not make judgments about the miners, the ranchers, or the Indians.

Q No, but you made a lot of judgments about their country, and that's what concerns me. Now, Mr. Logan, were you ever in Montana professionally before March 5, 1976?

A Yes, sir.

Q When?

A I was, about nine years ago, in this city at a HUD meeting where we allocated HUD 701 planning money for about two days. I spent two days in Billings -- I think it was either last September or August. I spent another two days in Billings with

Mr. Bellingham and Mr. Cumin in late February.

Q Was that preparing for this testimony?

A It was, and I spent two days on the trip to Colstrip.

Q So including your trip to Colstrip and including the time Mr. Bellingham worked with you on this statement, you've been here eight days in Montana?

A Yes, sir.

Q What concerns me is that some of your conclusions may be based on inadequate understanding of the community and of the state. Now, let's turn to your last paragraph --

MR. BELLINGHAM: We move that the statement be stricken.

MR. GRAYBILL: Okay, strike it or not, I don't care.

HEARINGS EXAMINER: It will be stricken.

Q Let's look at the last paragraph of your statement.

A Page 12?

Q Page, on line 15. You say: "The community of Colstrip is a well-planned single industry community." What single industry is it well-planned for?

A For the purpose it's there. I assume the Montana Power --

Q I don't want what you assume. I want your facts. Assumptions are just guesses, in my book. You made a statement here that it's a well-planned single industry community. What single industry is it a well-planned community for?

A I'm searching for the words to define the industry, but it's the industry in which Western Energy and Montana Power are in business for.

Q Well, is that a single industry?

A I would call that a single industry, the development of power and the mining of coal.

Q Pardon me?

A In my judgment, it was a single industry community.

Q You are of the opinion that the mining industry and the electrical generation industry are the same industry?

A I would say that they're tied together.

Q Well, of course, they're tied together sometimes, but they're also very independent sometimes, aren't they?

A Yes.

Q Which single industry, mining or electrical generation, do you think Colstrip is well-planned for?

A I would clarify that to say that my interpretation, assumption and opinion in the last sentence, were based upon that the two industries were linked, and as I comment about a single industry, it's in that context that it's a single industry. I would not pick one or the other as being well-planned for. I would say it would be well-planned for either industry, if you want to separate them.

Q How many companies are mining coal in Rosebud County?

A I'd say that there are probably half a dozen.

Q Can you name them?

A No, I can't, sir. I've seen some of them, I know their names. They are Peabody Coal. There are a couple that are just south of there, different companies. I saw the signs as I drove by, but I don't recall them.

Q How much electrical energy has Peabody Coal produced in the last few years?

A From that site?

Q Yes, in Rosebud County.

A I have no idea, sir.

Q Well, would it surprise you that they're not in the electrical energy?

A It would not surprise me, sir.

Q Did you know that Western Energy mines coal and ships it out of Montana out of Rosebud County?

A I did not know that, sir.

Q You didn't know that the principal business of Western Energy Company was shipping coal to the East?

A I know that Western Energy mines the coal, but I didn't know where it went or what they did with it.

Q Did you really assume that most of it was used right there in Colstrip?

A I apologize if I did, but I did.

Q So really, you don't know a whole lot about it, do you, Mr. Logan?

A I'm not an expert on the coal industry, sir, and I did not say that I am an expert on the coal industry.

Q Just on how it affects communities?

A I would say that I do have expertise on community development.

Q Pardon me?

A I have expertise on community development.

Q You've just now, in my judgment, apparently separated the coal industry from the electrical industry, is that right?

A I'm not qualified to separate them, to be very honest with you

Q Well, all right, I'm asking whether you're qualified to say whether Colstrip is a well-planned single industry community if you don't even know what the industries in Colstrip are?

A It's a company town. It's owned by one company. They may contract for services by somebody else. The purposes of my assumption and my opinion, I was looking at it as a well-planned community for either industry, both owned by the same company.

Q Now, Mr. Logan, would it surprise you to hear that the industry I think the Colstrip community is well-planned for, you haven't mentioned yet?

A I don't know.

Q Well, think a little bit about whether or not there are any other industries in the Colstrip community. I notice you didn't use the word, town, you used the community of Colstrip. Can you think of another industry down there?

A The reason I used the word, community, is, that as I understand it, Colstrip is not incorporated, and usually you get a town or city designation.

Q You don't need to incorporate it if one company owns it, do you?

A But it's usually not called a town, either.

Q If it were incorporated, there would be a city government, wouldn't there?

A Or it could be a town government or a village government, depending on what --

Q The citizens would have something to say about it, wouldn't they?

A Sure.

Q But they don't, do they?

A I don't think that it is a typical community, and I do not think that you can classify Colstrip and compare it to Forsyth or Hardin or any of the other communities. It's not a typical community.

Q It's not a typical community?

A That's right. It's a company town. It's for a purpose. I happened to be reading in this Westmoreland study that Colstrip has been a company town since 1923.

Q Whose company?

A There seems to be a long history. The first one was the railroad. I forget the name that they were using then. It was a railroad town back in 1923.

Q Now, you haven't answered the question that I really addressed myself to and that is, what other industry, if any, do you recognize as being important in the Colstrip community?

A I don't know, but if you ask me what other communities could use that company town, I could give you a list of industries that could use that company town.

Q Well, I want to know what one has been using that company town since about 1890?

A The history of the community that I read in this report was from 1923, that it's been a coal town, and it's been a company town and they've been mining coal in that community.

Q Maybe the problem you're having with your community is that you don't understand its history, then. Did you ever hear of the livestock industry?

A Yes, sir.

Q You have heard of it?

A Yes, sir.

Q Did you notice any indications that Colstrip might be a town that was associated with the livestock industry, Mr. Logan?

A There was one building that was close to the railroad that had a grain tower, but that was the only building that I saw that appeared to be a non-urban community oriented type thing.

Q Well, would you take my word for it that the livestock industry has been operating in and around the Colstrip community longer than the coal industry?

A I would take your word for that.

Q Do you think that the community of Colstrip is well-planned as a livestock industry community?

A I do not judge that that's the purpose of the community, sir.

Q I'm not asking you to judge the purpose of the community, I'm asking you if it's a well-planned -- I think that's the word you used -- a well-planned livestock industry community? Did you see a stockyard there?

A I didn't see a stockyard.

Q Do you know why?

A No.

Q Because the company town took the stockyards out of town. Does that help the livestock industry?

MR. BELLINGHAM: We move to strike Mr. Graybill's statement on the grounds that it's not in evidence and it's strictly his own testimony.

MR. GRAYBILL: I think it is in evidence, but if you'd prefer for me to put it in the assumption --

Q Would you assume for me, Mr. Logan, that there was a stockyards in Colstrip, which, in fact, there was, and would you assume, for me, that it's been removed from the town of Colstrip owned by Western Energy Company? Now, my question is, does the removal of that stockyards enhance the community of Colstrip as a livestock industry center? Is that a tough question?

A I'm confused, frankly, because I think uses change constantly in any community, and I think that this has to be recognized, and whether that community was once a livestock community, or whether it was once a trading center for the farm group, many communities go through changes, and I don't find it unusual. I don't find it unusual when a property that's owned by one individual, which is similar to a subdivision or a plan of development, excludes a particular use. This is not an unusual occurrence.

Q No, but it does have something to do with what the members living in that community expect out of their community, and whether the community is being planned for their benefit and health and happiness, doesn't it?

A I don't think that there are the same expectations in a company town that there are in a normal-sized community. I don't think an individual goes through the same choices in picking out where he wants to live, based on that type of criteria.

Q Have you ever studied a livestock community that's been turned into a coal mining community?

A No.

Q Well, then, you probably wouldn't understand, but the problem, you see, is that we've changed the use of the community and apparently without the --

A I think this happens, and the point I was trying to make is that when you take an area around a big city and all of a sudden the suburbs catch up with the farms, you've made the same change, and that is, that there are changing uses going on in a community. You can look around any major city and see how urban development is now located in once agricultural lands, and this change is not that unique.

Q Mr. Logan, I'm just trying to follow your logic, because here you are, a person who's been in Montana for eight days, two of which you were writing this statement, two of which you were doing something that had nothing to do with it, and you've made a lot of conclusions in your statement here, and one of them, that I can't understand, is this one on page 6, which says: "The best approach is to build a solid base of understanding and community support." Now, what did you find or observe happening in Colstrip to build a solid base of understanding and community support between the mining community, the electrical generation community, and the livestock community?

A I don't see the same problems that you do, Mr. Graybill. I'm sorry. I did not find --

Q Is that question too hard for you to answer?

A It may be, but the problem, I guess, in my assumption is that I did not see problems in Colstrip. If you're talking about building a base of community understanding, I saw those problems in other areas around Forsyth, the rest of the community.

Q You're the one that talked about the building of a solid base of understanding and community support. Are you saying that we don't need a solid base of understanding and community support at Colstrip?

A I would not say that. I would say that you need it in the county, the total county.

Q What about the Colstrip community?

A I'd say yes.

Q What evidence did you see that there was anything being done to build a solid base of understanding and community support in Colstrip between your industry, including both coal and electrical, and the livestock industry, the ranching industry?

A I didn't see anything there between those three. Now, what I did see, if I could clarify that, is that I did see an attempt to build a community spirit and rapport among the people that live there, as evidenced in the community.

Q Through what governmental unit was this attempt to build a community rapport being fostered?

A As I understood it, it was a club that was sponsoring some of the construction work in the community center. Western Energy was providing some of the stimulus to it, but quite a bit of the project was being built on the donated time of the workers themselves.

Q Is there a governmental unit in Colstrip that I don't know about that you know about?

A I did not say there was a governmental unit.

Q Is there one?

A The Colstrip school district --

Q Pardon?

A The school district.

Q The Colstrip school district -- the only one, right? In other words, we have a place where there's no active government representing the citizens, is that right?

A The county government, of course, represents the citizens.

Q Well, you wouldn't say that the county government in Forsyth represents the citizens in Colstrip in their local concerns, would you?

A I think you could get that question poised to any citizens in any part of the country as to whether he's represented. As far as I'm concerned, he is represented, and he votes, and he has the opportunity of voting.

Q Well, we just found out that Colstrip is really almost the same size as Forsyth. Now, did you find a city government in Forsyth?

A The one fact that I think is overlooked --

Q Would you answer my question, Mr. Logan?

A I'd like to try, Mr. Graybill, and that is that --

Q Your answer can't possibly be material. Did you find a city government in Forsyth?

A I did not find a traditional form of city government in Forsyth.

Q You did not find a traditional form of city government in Forsyth? Did you look?

A I looked.

Q What does Forsyth have for a city government?

A Forsyth has a very efficient manager form of government that would be not much different -- in fact, it's probably more effective than many communities of its size.

Q Mr. Logan, I don't want to waste our time here. Don't you really mean Colstrip? I'm talking about Forsyth now.

A I'm talking about Colstrip.

Q Let's get together now. The question was, did you find a city government in Forsyth?

A Yes, there is a city government in Forsyth.

Q And we've got another city of almost the same size in the same county, with no city government, isn't that true?

A In a traditional form, it has no city government.

Q And it has a city manager the local citizens don't get to vote for?

A They don't get to vote on a city manager in many forms of government that I know of.

Q But they always get to vote for a commission or somebody that controls the manager, don't they?

A In a traditional community.

Q Well, in 99,001, right?

A Not in company towns.

Q Oh, not in company towns?

A And I think that's really the distinction, in my mind, that this is a company town.

Q On page 8 of your statement, you talk about the capacity of local government to respond. By local government, do you mean city or community government, or are you talking about county government?

A County. As I understand it, they have a joint City-County Planning Board, in which the final decisions are made by

Forsyth or Rosebud County, depending on the issue.

Q And none of the final decisions are made by Colstrip, are they?

A Again, it's a company town, sir. That's not unusual.

Q We just haven't let them make any local decisions there, because it's a company town, right?

A As a comparison, you can look at any large subdivision in the country, where the developer makes the decision.

Q I really don't want to waste a lot of our time, but I do know something about subdivisions. You're not under the illusion that the developer makes the decisions in the subdivisions of our major cities, are you, to the exclusion of a governmental unit?

A In many of the large subdivisions that are in counties or outside of cities, a developer basically makes the decisions that you're alluding to. He decides where the streets are, where the sewers are. Sure, the government reviews those, but he's the one that's making those decisions.

Q Well, let's not argue about those towns. Let's get back to page 8, because I think that's -- I don't know whether you're talking about southern California or Idaho or where, but let's talk about this. What problem is it that local government has to respond to?

A In the case of Rosebud County? I think some of the problems are caused by fast growth. I think there has been fast growth, in my mind. The population has grown from 1970, of 6,000, to approximately 9,000 five years later -- six years later, and there have been problems associated with people and growth.

Q So wherever there's been 3,000 growth in the county, you think you need planning, is that right?

A It depends on what the size of the community is to start with. If it's a town of 150,000, you may be able to accommodate 3,000 people rather easily.

Q The reason for that, Mr. Logan, would be because you have existing facilities and existing groups planning in a community of 150,000, don't you?

A Not necessarily. Most of the large communities of the United States have never adopted a plan. I'm not trying to be obtuse on the thing. They have not adopted a plan.

Q I know you're not, Mr. Logan. I'm sorry I got myself in a box, because I'd like to talk to you for about two hours on this subject, but I think I'm going to ignore that. You've also investigated in Wyoming the rapid growth in the electrical industry counties, is that what you said?

A I'm working on a project right now at the State Planning Coordinator's Office. They've been asked by the Department of HUD to be involved in a pilot project which would look at how to provide coordinated services from the state and federal agencies.

Q Are you talking about Wyoming?

A You asked about Wyoming.

Q So you do know something about the Wyoming communities?

A Yes, sir.

Q Have you found their development to be good?

A No, I think they have problems.

Q And you think we have problems at Colstrip, too?

A No. I think you've got less problems because it is a company town, than any of the other communities where the property ownership is --

Q So your advice would be for Western Energy to continue to hang on to it?

A My feeling is, and I have not talked to Western Energy about this, that I would think they would need to look at all of the ramifications until and if 3 and 4 are built. I think that Colstrip is in a lot better shape because it is under one ownership than if it was under a whole group of separate owners.

Q You think it ought to be kept a company town?

A I did not say that.

Q Well, I'm asking you -- do you think it should be kept a company town?

A I agree with the move that they're making to gradually phase it out.

Q Well, they've phased out pretty gradually so far, haven't they? How many houses have they sold?

A When I was out there, Mr. White indicated that they had received FHA approval, Farmers Home Administration approval, on 10 or 15 houses, which then they were going to start processing. I don't know the number. This is just a figure that I heard, but I would hope that they would hold onto the property adjacent to the community so that there could be orderly growth.

Q Let's not worry about that. Let's test your credibility on knowing the subject matter here. On page 9, line 17, you say that Colstrip 1 and 2 have been an addition to the tax base. Do you know of anything else that's been an addition to the tax base in Rosebud County?

A Recently?

Q Yes.

A No, I don't.

Q Would it surprise you to find that there's another industry that's been in addition to the tax base equal to, if not greater than Colstrip 1 and 2?

A I'm not aware of it, sir.

Q I know you're not aware of it; would it surprise you?

A I'm surprised.

Q You are surprised?

A I'm not sure.

Q Do you know of any good reason why Peabody Mine employees have been asked to vacate one of the trailer courts in Colstrip?

A No.

Q Do you think it's a good idea to have a trailer court that one class of employees of another company can be ordered out of? Do you think that's good community planning?

A For a company town, I would say that's probably their right, just as it is a developer, if he owns an apartment. He can decide whom he wants to rent to, within reason.

Q The company can decide how many stores you can buy groceries at, too, can't they?

A Yes, sir.

Q The company can decide how many bars they will have in town?

A A developer can do the same thing in a subdivision.

Q How many bars are there in Colstrip?

A I didn't check. I saw one or two. There was one across the street I noticed going in.

Q How many barbershops?

A I saw one.

Q You saw one? You're sure of that?

A I am.

Q One of the other planners that came here couldn't find it.

A I understand that it was just newly on the scene.

Q Is this a new barbershop temporarily put in for the purposes of the hearing?

MR. BELLINGHAM: Leo, you wouldn't be interested in the barbershops anyway, with or without a hearing.

Q On page 10, you say the plan, that is, the Ken White plan, was termed inadequate for the following reasons, and No. 2 is that the plan was termed inadequate because it was dull and unimaginative. Who said that the Ken White plan was dull and unimaginative?

A That was Mr. Cogan's testimony.

Q And you felt it wasn't, is that it?

A Sir?

Q You felt it wasn't?

A I think it was a pretty good plan. It served as basis for the Ted Wirth plan and the engineer's plan that laid out the details of the community. It was a good benchmark study.

Q Did you learn that many of the workers at Colstrip, that is, workers on the project, elected not to live in Colstrip?

A I wasn't aware of that, because my information was that the temporary transient construction workers, the majority of them were living in the trailer park and the impacts to the other communities was not that substantial.

Q Well, one of the company's own witnesses explained that a great many of the workers did not live in the town of Colstrip.

A Was this temporary or permanent?

Q Both temporary and permanent.

A I have no idea. There is space there, from what I gather.

Q Can you think of any reason why a worker at that Colstrip plant down there wouldn't want to live in Colstrip?

A It's a long way from an urban area, from Billings; it's a long way from Forsyth.

Q In your experience as a planner, have you ever found that some people don't like to live in a company town?

A From what I gathered in talking with the Western Energy people, they indicated that there was a problem between a worker paying rent and also receiving his salary from the same person, and that made logical sense to me, but there was a problem.

Q You really lost me. How does that answer my question?

A I'm saying that I agree. The logical of their point was that there is a problem in maintaining a company town because the worker doesn't like to pay his rent for his house to the same people that he's he getting his paycheck from.

Q So you have found that?

A I'm basing my statement upon Western Energy.

Q So they have found that to be true?

A This is what I understand.

MR. GRAYBILL: That's all.

HEARINGS EXAMINER: Redirect? Mr. Bellingham.

Rebuttal, Redirect, by Applicants

By Mr. Bellingham:

Q Page 12, line 15, you say the community of Colstrip -- now, you refer there to the so-called town of Colstrip, is that correct?

A Yes.

Q How many local community comprehensive plans have you been responsible for, or been involved with, do you have any idea?

A Over the years, I was the Administrator of the HUD 701 Planning Fund in the state of Oregon and was probably responsible for or involved in 40 or 50 local plans developed in the state.

Q I think you were cut off when you were answering about organizations that you did not choose to join, or at least, I got that impression. Do you have anything to add to that?

A In reference to Mr. Shenker's question, I deemed it, in my personal opinion, appropriate to join the International City Managers Association. I am not a member of any planning society. I have from time to time been a member of the American Society of Planning Officials for publication purposes.

Q I think you touched briefly upon the gain in population, but as far as Montana is concerned, 1960 to 1970, I think you mentioned around 40,000 gain. Do you have any idea of what percentage that was?

A From the figures I've seen, it's approximately 7.7%.

Q I'm talking from 1960 to 1970.

A Oh, I'm sorry. It was a gain of approximately 2%, and as I mentioned, 39 out of 56 counties actually lost population.

Q From 1970 to 1974, do you know the percentage?

A The increase was approximately 7.7% with a gain of about 40,000 people.

Q And what was the gain between 1960 and 1970?

A I don't have the actual gain.

Q Can you compare the impact that you might perceive 3 and 4 will have upon the community as compared with 1 and 2?

A In my judgment, I think that the impact to the community of Colstrip, Forsyth, and Rosebud County have already been felt by the development of 1 and 2 and that the development of 3 and 4 will probably be negligible because of the corresponding loss of employees in the construction of 1 and 2 at the same time 3 and 4 are gearing up for construction.

MR. BELLINGHAM: No further questions.

HEARINGS EXAMINER: Mr. Shenker?

MR. SHENKER: Nothing, thank you.

HEARINGS EXAMINER: Very well, you're excused.

(WITNESS EXCUSED.)

MR. PETERSON: We'll introduce at this time the testimony of Dr. Anthony V. Colucci on behalf of the Applicants.

HEARINGS EXAMINER: Any objections?

MR. SHENKER: No objections. We waive cross-examination.

MR. MELOY: The Northern Cheyenne waives cross-examination.

HEARINGS EXAMINER: Mr. Graybill?

MR. GRAYBILL: I waive.

(THE WRITTEN DIRECT TESTIMONY OF DR. ANTHONY V. COLUCCI WAS DIRECTED TO BE INSERTED AT THIS POINT.)

TESTIMONY OF DR. ANTHONY V. COLUCCI

My name is Dr. Anthony V. Colucci. I am Vice President for Health Programs of Greenfield, Attaway & Tyler, Inc.

I possess a Doctor of Science Degree in Hygiene and Pathobiology from the Johns Hopkins University School of Public Health, and over the past several years I have been engaged in numerous activities which relate to the assessment of the impact of environmental pollutants on human health. Presently, I am Vice President for Health Programs of Greenfield, Attaway & Tyler, Inc. (GAT), an independent consulting firm located in San Rafael, and I have conducted numerous studies both for government and industry which have focused on an assessment of the overall impact of pollutants on human health.

Prior to joining GAT, I was a member of the research management staff of the EPA National Environmental Research Center at R.T.P., North Carolina. In this capacity, I served as chief of both the Biochemistry and Physiology Branch of the Pesticide and Toxic Substances Laboratory and the Bioenvironmental Laboratories Branch of the Human Studies Laboratory. I also served as center-wide coordinator for physiology programs relating to assessment of pollutant induced adverse health effects.

In my capacity as chief of the Bioenvironmental Laboratory, I was responsible for analysis of all air monitoring data collected in the EPA Community Health and Environmental Surveillance System (CHESS) program, development of all bioindicators of response to pollutant stress and a member of the team coordinating CHESS epidemiologic studies nationwide.

I am a contributing author in the EPA-CHESS monograph:

Health Consequences of Sulfur Oxides - a Report from CHESS 1970 - 1971 and I have authored 40 publications and technical reports dealing with the health effects of air pollution including gases, metals, particulates and pesticides.

I have been requested by Applicants to prepare testimony reviewing the technical issues relating to the sulfur dioxide/ sulfate problem. To this end, I have reviewed a large body of past and current literature concerning the dose-response relationship for sulfur oxides relative to current literature which alleges to support a relationship between emitted SO_2 and ambient levels of sulfate, and also reports which attempt to relate ambient sulfates to mortality and morbidity in the general population.

At present, the knowledge relative to sulfur dioxide (SO_2) transformation in the ambient environment has relied heavily upon a broad spectrum of postulated mechanisms - most of which have been thoroughly outlined in a report prepared by my staff and myself for Commonwealth Edison. It is my assessment of the situation at this time that the reactions governing the conversion of SO_2 to higher oxides of sulfur are so complex and incompletely understood that no postulated mechanism can be considered to be preferentially acceptable over another. The result of this lack of understanding leads to the inevitable conclusion that attempts to unequivocally ascribe sulfate loading in the ambient air to sulfur dioxide emissions in some quantitative sense are at very best premature. Overlaying this high degree of uncertainty as to the preferred mechanism is the fact that all of the mechanistics of the various reactions that are involved in conversion of SO_2 to sulfates or higher oxides of sulfur are dependent on a number of factors other than the concentrations of the principal reactant. Examples include humidity, the relative abundance of catalyzing particles, ammonium ion concentration and other oxidizing pollutants such as NO_x. In addition, pH has a substantial impact on the rate of formation and in any given set of circumstances the varying reactions themselves can be limited. For example, it has been demonstrated that the reaction mechanisms can be saturated and as such then what is observed is a fixed level of sulfate produced even in the face of increasing concentrations of SO_2 simply because critical reactants are limiting.

At this time, I can only state that the whole issue remains highly speculative and thus under these circumstances it is virtually impossible to understand clearly what mechanisms are involved. I would also like to underscore the widely held position that the many problems in assessing the physical/chemical transformation of SO_2 to sulfate in ambient air as well as in power plant and ground level air pollutants are going to have to be quantified and, a much better definition of what role catalytic compounds and other precursors play in the formation of sulfates must be provided before any decisions regarding specific control strategies designed to limit sulfate formation are made. The above considerations lead us to the issue of sulfur oxide transport and accumulation in ambient air. My report prepared for Commonwealth Edison deals extensively with these issues.

Although it is difficult to understand quantitatively what reactions are taking place in terms of SO_2 conversion to other sulfur oxides it is possible using some transport models to estimate what the concentrations of total sulfur will be occuring at several distances from the source under a number of varying atmospheric conditions. It should be remembered that these would be in the form of total sulfur concentrations and again would have to be modified to include some reasonable transformation rates of SO_2 to other sulfur oxide species. In recent years there has been a great deal of progress in long-range transport models development. However, it is clear, even at this stage, that none of these models are capable of providing accurate quantitative assessment of air quality particularly at specific points in space and time. The problems with the models stem from the fact that they lack complete understanding of the multitude of chemical and physical processes involved and of course the available data is somewhat inadequate for validation purposes. However, it is possible, despite these problems, to reach some conclusions regarding the gross features of long-range pollutants concentration with some degree of confidence. Further, it is even possible within limits to estimate upper and lower bounds of what the potential impact of any given source will have on air quality at a given site.

Of the several available models, the one developed by Ferber, et al. is the one we felt was most applicable to an assessment of the effect of midwestern sources on pollutant levels over the northeastern United States. In the study carried out by Ferber et al., wind data was collected from all available weather stations in the Northern Hemisphere for a one-year period. These data were subsequently used as inputs in a long-range transport model to simulate emissions from a hypothetical source in Morris, Illinois. Unfortunately, this model incorporates several simplifying assumptions that preclude a literal interpretation of the spatial details of the numerical results. The main assumptions and weaknesses of the model and their likely effects on the calculations are as follows:

(1) Surface pollutants are assumed to remain below a level of fixed height and to move with the average wind in this layer. In actuality, some material can penetrate to greater heights than those assumed where wind speeds and directions may vary from those in the lower level of the atmosphere. On the average, pollutants would thus tend to be more spread out than the model calculations indicate.

(2) The model incorporates a simplified treatment of the effects of wind variations smaller than those resolvable by the data because an accurate theoretical description of these flow features is not presently available. However, errors made in the representation of this position of the wind field can either attenuate or accentuate those generated by Assumption 1 above.

(3) Rainout, washout, and the dry deposition of pollutants are assumed to be independent of wind direction or location. In actuality rainfall is more probable for some wind directions than for others, and the dry deposition of pollutants, such as SO_2, varies from location to location, depending on the nature of the

underlying surface. Although this assumption might not have a large effect on the total annual deposition predicted for some large area, it could have a profound impact on the manner in which the deposition varies from place to place and from time to time within a given large area.

(4) Nonlinear processes, such as the chemical conversion of SO_2 to sulfates by photochemical pollutants, are not accounted for rigorously in the model. As a result, the interactions of sulfur emissions from one source with pollutants produced by other sources are not properly treated. This renders the model incapable of describing with any certainty the forms and concentrations of sulfur emissions at a given place and time.

Despite these limitations, theoretical techniques do exist that permit all of the assumptions made in the model of Ferber, et al., to be relaxed considerably. When these techniques are used to develop a more advanced model, the present estimates of air quality impacts at large distances from a source will be substantially refined.

Although the predictions made at specific sites by the model developed by Ferber et al. are sensitive to both random and systematic errors in the model and input data, the gross features of the model predictions, such as the total sulfur deposited in some large region, are influenced only by systematic errors.

Consequently, since the data used in the calculations made by Ferber et al. are virtually free of systematic errors and since the assumptions made in the model formulation are more likely to generate random errors than systematic ones, one can conclude that the gross features of the model calculations are more likely to be correct than incorrect.

Thus the most I can say, at this point, is that estimates of the extent of sulfur oxide transport and accomulation in ambient air are in many cases a gross approximation. However, for the purpose of most discussions these estimates are probably sufficient if one is concerned with short-range impact. If the primary concern is assessment of long-range impact, I feel that the data will suffer from a large number of inadequacies.

Despite the lack of definitive chemical data relative to SO_x in ambient air and the inadequacies in long-range modeling techniques EPA has consistently attempted to postulate quantitative rates explaining the physical/chemical characteristics of the SO_2 to sulfate conversion and further alleges that the long-range impact of point source emissions and sulfate levels in downwind areas can be quantified. Needless to say, at present, there is a tremendous dichotomy within the scientific community as to the adequacy of the EPA conclusions.

In general, EPA feels that SO_2 emitted from point sources can have a significant impact on sulfate concentrations downwind. The National Academy of Science (NAS) tends to concur with this conclusion. However, the Science Advisory Board (SAB) of the EPA suggests that because of dispersion this major impact would occur relatively near the emission sources. For this reason, the SAB suggests further that the impact of non-urban sources on urban areas is likely to be very minor and explains the observed "trends" in terms of precursor limited sulfate formation mechanisms which result from primary emission of sulfates.

The SAB conclusions from which EPA dissents are based on the assumption that dilution and removal would reduce sulfates almost to a negligible level during transport. Based on the results of our own investigation I favor the SAB conclusions over EPA or NAS with some minor caveats. Clearly proximal impact is likely to be the major consideration near emission sources. Long-range impacts will be minor and because of the inherent problems in all modeling techniques are difficult to quantify beyond 100 kilometers from the source. Even "worst case" assumptions however suggest that during transport sulfates will be reduced to negligible levels. I cannot concur totally with the SAB regarding the question of primary emission of sulfates per se. To date no unambiguous data base is available which allows either a qualitative or quantitative assessment to be made of the physical/chemical characteristics of particulate sulfur oxides emitted as primary particulate subsequent to their in-situ formation in plumes of power plants burning various types and grades of fuel including coal.

Thus while the presence of water soluble sulfates in particulate matter has led many knowledgeable experts to speculate about their source and species it is my opinion that such speculation should not be accepted as fact by regulators attempting to limit their presence in the environment.

The status of current monitoring data on atmospheric sulfur oxides are generally more adequate than the previously discussed data on transport and transformation. Techniques for measuring SO_2 are less precise than is desirable yet adequate enough to provide limits of exposure. Similarly, while from a toxicological standpoint the term "atmospheric sulfates" is meaningless data on sulfate concentrations are becoming increasingly more widespread. Unlike SO_2 the accuracy of the sulfate measurement technique is open to wide criticism. Thus at best only rough approximations of national levels can be made. By contrast monitoring data on other (perhaps more critical) sulfur oxides such as acid mists and sulfites is generally lacking or non-existent. This dilemma makes it impossible to set any upper or lower bounds on community exposure levels to these pollutants.

Based on our own investigations, I conclude that little if any definitive data is available on the qualitative or quantiative aspects of SO_2 conversion to other sulfur oxides in the atmosphere. Thus measurement of SO_2 alone cannot be used to estimate levels of other sulfur oxides such as sulfuric and sulfurous acid, sulfates or sulfites.

With regard to Federal Primary ambient air quality standards, as written, the Clean Air Act assumed, that for each pollutant there exists a threshold concentration, corresponding to an exposure time, below which harmful health effects do not occur.

Basically, information to set the standards is gathered in three different ways:

1. Studies in which experimental animals are exposed in the laboratory to air pollutants.
2. Studies in which humans are purposely and knowingly exposed

to air pollutants.

3. Epidemiologic studies in which the effects of exposure to air pollutants are studied in large groups of people, such as an entire community.

What then are some of the health effects which have been looked for by scientists in their attempts to understand the effects of air pollution on human health?

Scientists have conducted studies of healthy people and not-so-healthy people; of young and old; of people who live in rural areas and of people who live in cities; of people who live in climates which are very cold in the winter and of people who live in warmer areas. The occurrences of various illnesses and disabilities as well as frequency and causes of death have been studied. Specifically, the following have been studied: the effects of air pollution on aggravation of heart and lung problems in the elderly, aggravation of asthma, chronic bronchitis in adults, acute respiratory disease in children (lower respiratory tract infections), severity and frequency of acute respiratory disease in families, decrease in lung (ventilatory) function in children, increase in hospital admissions for respiratory illness and increased mortality.

The current 24-hour federal primary ambient air quality health standard for sulfur dioxide is 365 micrograms/m^3 (ug/m^3) (0.14 ppm). The Montana standard is more stringent, being 0.10 ppm or 265 ug/m^3.

Review of the available epidemiologic data upon which the 24-hour federal SO_2 standard was based points to a 24-hour threshold between 300 ug/m^3 and 500 ug/m^3, with the strongest evidence suggesting a threshold approaching the federal 24-hour SO_2 standard of 365 ug/m^3.

Thus, based upon our examination of health-related data available at this time, it is our opinion that the national 24-hour ambient air quality standard for SO_2 of 365 ug/m^3 is reasonable and justified and the Montana standard more than reasonable.

The current annual federal standard for sulfur dioxide is 80 micrograms/m^3 (ug/m^3) (0.03 ppm), while the Montana standard is 0.02 ppm or 52 ug/m^3.

Health information gathered thus far indicates that no significant increase in morbidity results from long-term exposures to SO_2 concentrations below the currently regulated federal annual average (80 ug/m^3). Thus I conclude that concentrations of SO_2 below the current annual standard cannot be judged as being harmful to health and certainly a greater margin of safety is included in the Montana standard.

The current federal primary maximum 24-hour level for particulate matter is 260 micrograms/m^3 (ug/m^3) while for Montana it is 200 ug/m^3 not to be exceeded for more than 1 per cent of the days a year.

Review of the available epidemiologic data upon which the 24-hour federal particulate matter standard is based supports a threshold between 300 and 375 ug/m^3. Thus, the current standard of 260 ug/m^3 would be below these levels. However, more recent results from the EPA Community Health Environmental Surveillance System (CHESS) studies indicate that harmful health effects occurred at particulate matter concentrations below the 260 ug/m^3

24-hour level, in the best judgment of the researchers conducting the studies. The specific adverse effect reported involves aggravation of cardiopulmonary symptoms in the elderly which is reported to occur at particulate matter concentrations of 80-100 ug/m^3 and above at 24 hours. It is important to note, however, that these CHESS studies were designed to be conducted over a minimum of a five year period, and the above conclusion was arrived at solely on the basis of one year of observations. As such these reported adverse effects require reconfirmation by future studies, and further refinement which enables a disintanglement of other confounding pollutants such as nitrates which are simultaneously present. Given the degree of uncertainty attendant to the early CHESS observations, we conclude that until they are resolved the present 24-hour primary standard for particulate matter is adequate to protect human health.

The current annual federal primary ambient air quality health standard for particulate matter is 75 $micrograms/m^3$ (ug/m^3), the same as Montana.

Information relative to adverse health effects of long-term exposures to particulate matter indicates no significant increase in morbidity results from long-term exposure to particulate matter below the currently permitted annual average of 75 ug/m^3. In the case of each key effect studied, a safety factor of at least 33% appears to be present in the currently permitted annual average level.

I will now discuss the findings from epidemiological studies with respect to sulfur oxides.

Both morbidity and mortality studies have been performed relative to the health effects of sulfur oxides on humans. Problems exist for both types of data, limiting the extent to which it can be used to demonstrate the adverse health impacts of any particular air pollutant.

In reviewing the mortality data, it becomes evident that there are no studies which can unambiguously correlate an increase or decrease in the level of SO_2 with changes in mortality. Rather, it appears that measurement of SO_2 appears to be a good indicator of general air pollution levels.

Interestingly, in this regard it should be noted that in their report of studies of mortality during air pollution episodes EPA uses only data for SO_2 levels and not sulfates. Thus it is understandable that in reassessing its position relative to sulfate effects on mortality the agency has chosen in its recent position document "EPA Position Paper on Regulation of Atmospheric Sulfates" (September 1975) to modify its previous position. The quote below is from page viii of this September 1975 EPA document:

> "When viewed together, the results of the toxicological and epidemiological studies suggest that specific sulfates may also be responsible for the observed excess mortality associated with high SO_2 concentrations. However, an association between sulfates and mortality has not yet been tested by field studies."

Since 1970 a major portion of the data on morbidity attributable to sulfur oxides has been collected through EPA's Community Health and Environmental Surveillance System (CHESS) program. I came into the CHESS program shortly after its inception and participated in formulating the initial conclusions relative to SO_x health effects reported in the recent May 1974 EPA monograph entitled "Health Consequences of Sulfur Oxides: A Report from CHESS 1970 - 1971." This report has been the focus of intense review recently particularly because of its major preliminary conclusion that sulfates rather than SO_2 are the most likely agent responsible for the exacerbation of disease attributable to airborne sulfate oxides.

Although these results were preliminarily selected members of the EPA staff have concluded without reserve that sulfates are the prime cause of increased morbidity such as excess asthma attacks and excess chronic bronchitis in several major U.S. cities. Furthermore, they have hypothesized that these sulfates are principally formed from SO_2 emitted by large stationary sources such as fossil fuel power plants.

This extrapolation has necessitated an indepth review of all CHESS findings set forth in the monograph of May 1974. To this end several groups including ourselves have reviewed these data. Highlights of major conclusions appear below.

In its March 1975 report entitled "Air Quality and Stationary Source Emission Control", the National Academy of Science has stated that present epidemiology studies have failed to clearly quantify the effect of sulfates on humans. However, in view of the toxicological data, which reports that sulfates are more potent irritants than SO_2 the National Academy of

Sciences regards sulfates as the prime sulfur oxide responsible for adverse health effects.

In their review of the sulfates issue, the EPA Science Advisory Board (EPA March 1975) concedes only that epidemiology studies suggest that sulfates are the "culprit" pollutant. They conclude that, "recent epidemiology studies are suggestive, but not conclusive, that acid sulfates are the primary health hazard among sulfur compounds in the atmosphere." They (SAB) regard the toxicology data as less important for the purpose of determining a casual relationship between sulfates and health effects.

Based on my own review of the preliminary CHESS findings and reports issued by CHESS subsequent to the publication of the monograph it is my opinion that the Preliminary EPA-CHESS conclusions linking adverse health effects at levels below the current 24-hour standards by ascribing them to sulfates are unsubstantiated for the following reasons:

(1) The EPA-CHESS study group has not adequately measured the perturbations in morbidity patterns in their study populations sufficiently to ascribe adverse effects to even general air pollution, let alone sulfate.

(2) Many of the initial findings of the EPA-CHESS studies have been contradicted or confounded by follow-up studies. For example, in the New York area studies using asthma as a short-term indicator, data collected during 1970-71 led the EPA-CHESS investigators to report that sulfates exacerbated asthma. However, the

follow-up studies conducted in 1971-72 contradicted the initial findings.

(3) The CHESS studies in New York during 1970-71 using chronic bronchitis as a long-term indicator reported excess chronic bronchitis in New York City was attributable to sulfates. The follow-up New York study conducted in 1971-72 reported that the chronic bronchitis rate has decreased four-fold despite the fact that from 1970-72, the sulfate level in New York City did not change. I must conclude that this assessment of sulfate contribution to excess chronic bronchitis was incorrect. Even if sulfates were exacerbating chronic bronchitis, in my opinion, the EPA-CHESS studies could not show this effect nor serve as a basis for promulgation of a quantitative threshold for that effect.

Therefore, I conclude as follows:

Data from these health effects studies suggest that at concentrations at about the 1.0 ppm level SO_2 alone is at worst a mild respiratory irritant. It is only in combination with particulate that SO_2 appears to elicit any response and even in this regard the contribution of SO_2 cannot be unambiguously weighed. It is because of these facts that recent experts have attempted to ascribe observed health effects to other sulfur oxides such as sulfates rather than to SO_2 alone.

However, it is my opinion that the present published environmental and medical data, with respect to the health effect of sulfates, are inconclusive and speculative. Furthermore, the assumption that the health effects of sulfur-bearing pollutants are largely due to the formation of sulfates is very theoretical, and that promulgation today of quantiative standards of a specific control strategy of SO_2 aimed at reduction of atmospheric sulfates based on these assumptions is unwarranted in light of present knowledge.

There are two components in the issue of the future of sulfate standard which must be underscored. Actions are eventually expected to occur at both the federal and state levels. The current setting of sulfate standards by several states is an action that strongly reflects the ripple effect of recent allegations by EPA that sulfates constitute a primary (significant) hazard. However, in the foreseeable future the federal EPA is not expected to set a standard for sulfates. Referring back to the CHESS monograph of May 1974 and as recently as September 1975 in its position document EPA states that:

> "In view of the available data it is the best judgment of EPA that an air quality or other major regulatory program for sulfates is not supportable at this time."

Also EPA discusses in great detail the needs for additional research to fill the information gaps both in terms of health effects, physical characterization, chemistry, transport, and transformation of sulfates. They concede that the research program will require a number of years to complete. For these reasons it is doubtful that a comprehensive regulatory program specifically for sulfates can be initiated under the Clean Air Act before the end of the decade.

I do not believe that public health will be adversely affected by the Colstrip Units. There is a very substantial margin of safety built into the SO_2 air quality standards and the levels of SO_2 which are predicted will fall well within this margin of safety. As to sulfates, there is no scientific basis at present for assigning any public health risk to sulfate levels presently measured in the western part of the country. Furthermore, there is no basis to assume that the increased SO_2 emissions from the Montana Power Colstrip Units would significantly affect ambient sulfate levels. Therefore, I see no scientific basis to deny Montana Power's application for operation and construction of these Colstrip Units.

DR. STEPHEN M. AYRES, called as a surrebuttal witness by the Department of Natural Resources and Conservation, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. PETERSON: Mr. Davis, on behalf of the Applicants, we will waive the cross-examination of Dr. Ayres.

HEARINGS EXAMINER: How about the exhibit?

MR. PETERSON: We have no objection.

MR. SHENKER: Exhibit No. 252, for the record, we'll have to supply additional copies. There are corrections to Dr. Ayres's testimony on pages 3 and 6. On page 3, line 24, the words, "prudent man," should be in quotations. Line 25, the phrase should be "consensus where it exists" instead of "consequences where they exist." Page 6, line 10 should be Dohan et al. Line 19, change "if" to "unless." Line 23, delete the word "every." Line 22, "industry" was misspelled.

HEARINGS EXAMINER. Very well, sir.

(THE WRITTEN DIRECT TESTIMONY OF STEPHEN M. AYRES, M.D., WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATEMENT OF TESTIMONY

OF

STEPHEN M. AYRES, M.D.

My name is Stephen M. Ayres, M.D. I am Professor and Chairman, Department of Internal Medicine, St. Louis University School of Medicine.

I received my medical education at the Cornell University Medical College, and am a Diplomat of the American Board of Internal Medicine. I am a Fellow of the American College of Physicians, American College of Cardiology, and American College of Chest Physicians. I was a practicing physician for two years, Director of the Cardio-Pulmonary Laboratory at St. Vincent's Hospital in New York City, New York, from 1963 to 1973, Physician-in-Chief at St. Vincent's Hospital in Worcester, Massachusetts, and Professor of Medicine, University of Massachusetts School of Medicine, from 1973 to 1975. I assumed my present position in January, 1975.

My research and educational activities have centered around cardiac and pulmonary disease. I have written over 100 separate medical articles and given several hundred lectures, many of them relating to air pollution and cigarette smoking as causal factors in the development of lung disease. Enclosed with this testimony is a review article entitled, "The Effects of Urban Air Pollution on Health," which is representative of my views.

I was appointed to the Environmental Protection Board of the City of New York by Mayor John Lindsay, and have served as Chairman of the New York City Action for Clean Air Committee, Chairman of the Committee on Tobacco and Health of the American

Lung Association, member of the National Heart and Lung Institute Pulmonary Disease Advisory Committee, and member of the National Heart and Lung Institute Task Force on the Prevention of Lung Disease. In addition, I have testified at a number of federally sponsored air pollution abatement hearings, and before committees of both the United States Senate and House of Representatives on matters relating to air pollution and human health.

I have carefully reviewed the testimony of Dr. Anthony V. Colucci. While it is reasonably accurate it is somewhat misleading, and not directly relevant to the central issues. The bulk of his testimony relates to a technical discussion of the methods for estimating sulfur oxide contamination and for assessing air pollution exposure in general. There are certainly many important defects in our understanding of air pollution, but these scientific problems in no way change the basic belief that present levels of fossil fuel pollution are harmful to human health.

Dr. Colucci also attempts to refute the Chess Study findings and cast doubt on their reliability. The Chess studies are important because they confirm the conclusion of a host of previous studies. They are but a part of the entire fabric of scientific research which has established the significant health hazards of community air pollution.

The decision to develop new and coal-fired power generators in Montana must be considered in terms of the energy requirements of the region, the importance of energy independence in the United States and the effects of fossil fuel emissions on human health. The present polarization of self-serving industrial apologists on the one extreme and environmentalists indiscriminately aiming at any expansion of energy sources on the other extreme significantly complicates the decision-making process.

Any decision which might affect the public health must be taken with full knowledge of the economic impact of disease on the United States. While the preservation of human life is obviously a sufficient end in itself, the economic consequences of failure to prevent disease should not be underestimated. A recent study prepared by the Office of Research and Statistics of the Social Security Administration, for example, estimated the total health cost resulting from respiratory diseases to be in excess of $13 billion dollars each year. Since more than 80 percent of all respiratory diseases are potentially preventable, any economic cost of reducing respiratory risk factors must be weighed with the humanitarian and economic cost of not reducing these risk factors.

My position as a health professional and my vantage point as a member of the NIH Task Force on the Prevention of Lung Disease makes me question any action which does not speak to the goal of reducing human illness. I believe we must take conservative positions in this area, and build a considerable margin of safety into all of our efforts. While all of the data are not available, we should take the "prudent man" approach, and follow the scientific ~~consequences~~ consensus where ~~they~~ it exists. A conservative approach is particularly necessary when it is proposed to introduce new environmental hazards into relatively pristine regions. Most of our information is based on the study of areas that have been polluted for many generations. We do not know the effect of suddenly introducing a known irritant into a totally clean environment.

Almost all public health authorities accept the following statement. (The Report of the National Academy of Science, perhaps the most prestigious of all American scientific organizations is in agreement with these general statements) (1) Cigarette smoking, air pollution and occupational exposure are three important risk factors in the development of respiratory disease. All are preventable risk factors. (2) The general consensus among health scientists is that air pollution as a risk factor ranges from one-quarter as important to more important than cigarette smoking, depending upon the concentration of air pollutants. (3) While the precise nature of irritant pollution is not completely understood, the mixture of sulfur oxides and particulates released by the combustion of fossil fuels is most certainly a major contributor. Oxides of nitrogen play an additive role. (4) Atmospheric sulfur dioxide measurements have been most used as indices of air pollution since they were technically feasible, relatively inexpensive and subject to automation. Much of our present data is based on sulfur dioxide measurements. (5) Because of the presumed synergistic nature of irritant air pollutants, the difficulty in relating concentrations of sulfur dioxide producing experimental effects to those actually seen in irritant atmospheres and the known short life span of gaseous sulfur dioxide in both lungs and atmosphere, most scientists believe that sulfur dioxide levels underestimate the irritant potential of a polluted atmosphere. Particulate sulfate is known to be an end product of sulfur oxidation, and is also known to be extremely irritating to the lungs. A number of epidemiologic studies have related concentrations of sulfate in the atmosphere to the prevalence of respiratory illness in various populations. The Chess data was further evidence of this relationship, but was not the first data available. It was, in fact, concordant with previous observations.

Dr. Colucci (page 2) indicates that his literature review had centered on the relationship between emitted sulfur dioxide and ambient levels of sulfate, and on the relationship between ambient levels of sulfate and its prevalence in respiratory disease. While it is true that the precise dimensions of the relationships between the cause/effect nature of each factor yet is not known, the relationships between sulfur dioxide concentrations and respiratory disease are known with some precision and form the basis for the clean air standards promulgated by the Environmental Protection Agency. The entire sulfate issue was developed by scientists to further understand the complex relationships between fossil fuel pollution and human health. The lack of complete understanding cannot be taken as license for ignoring the basic premises which have been standard principles for the past decade.

The ethical problems associated with systematically exposing populations to various pollutant mixtures have forced us to use epidemiologic data for guidance. The episodic data from the Meuse Valley, in 1930, Donora, Pennsylvania, in 1948, and Great Britain, in 1952, demonstrated that fossil fuel contamination could kill and injure human beings. Sulfur dioxide and particulates became generally acknowledged as the resonable agents. A host of epidemiologic studies followed. These studies, reviewed in detail by us and by others, clearly related sulfur particulate pollution with human illness.

The irritant potential of particulate sulfate was experimentally demonstrated by Amdur and Corrin, in 1963. Particles remain in the lungs for many hours or days following inhalation, while gases move quickly in and out, accounting for the greater toxicity of sulfate particles over gaseous sulfur dioxide. This observation was supported by Dchan Etal, who demonstrated in 1972 that acute bronchitis among industrial workers in five cities was related to sulfate concentration, but not to gaseous sulfur dioxide or suspended particulates.

Had sulfate concentrations been measured in the early epidemiologic studies, a close relationship would most certainly have emerged. The Chess studies included sulfate measurements and found what scientists had predicted - - that sulfate concentrations were closely related to the prevalence of human illness.

Human health cannot be protected unless if available control methods are exploited. Delay while additional data is accumulating has been the standard fall-back position of the tobacco industries, automotive undustry and power generation industry. It, in every sense, throws out the baby of every consensus with the wash water of scientific detail, confusing decision-makers and allowing serious public health problems to persist. I am concerned that the introduction of a huge fossil fuel power generation system into Montana may significantly affect human health. Both reduction in size and addition of adequate sulfur removal technology are necessary to minimize this health effect.

WITNESS: I thank you all for your courtesy.

HEARINGS EXAMINER: Doctor, we could have had some interesting cross-examination if you had stayed, but take our regards back to St. Louis for us. You're excused.

(WITNESS EXCUSED.)

HEARINGS EXAMINER: We'll recess until 9:00 A.M. tomorrow morning.

(HEARING RECESSED AT 6:05 P.M.)